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MECCANO MAGAZINE

THE WORLD'S LARGEST TRANSFORMER

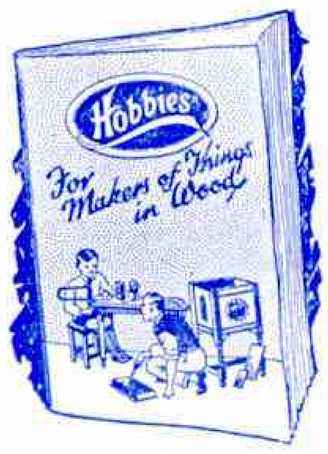
(see page 754)

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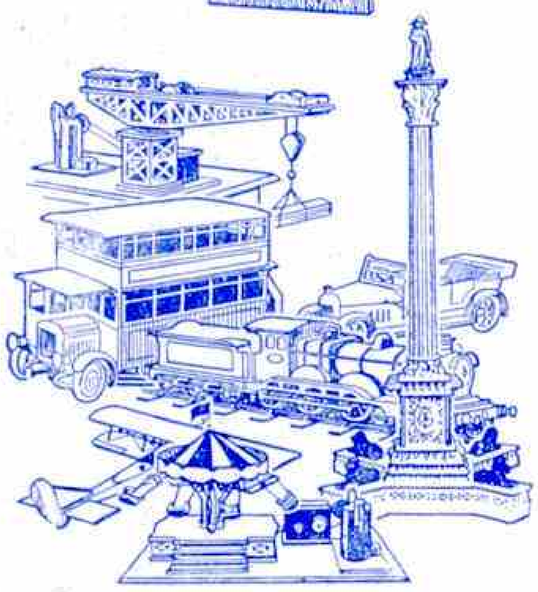


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With the Editor

The World's Busy Inventors

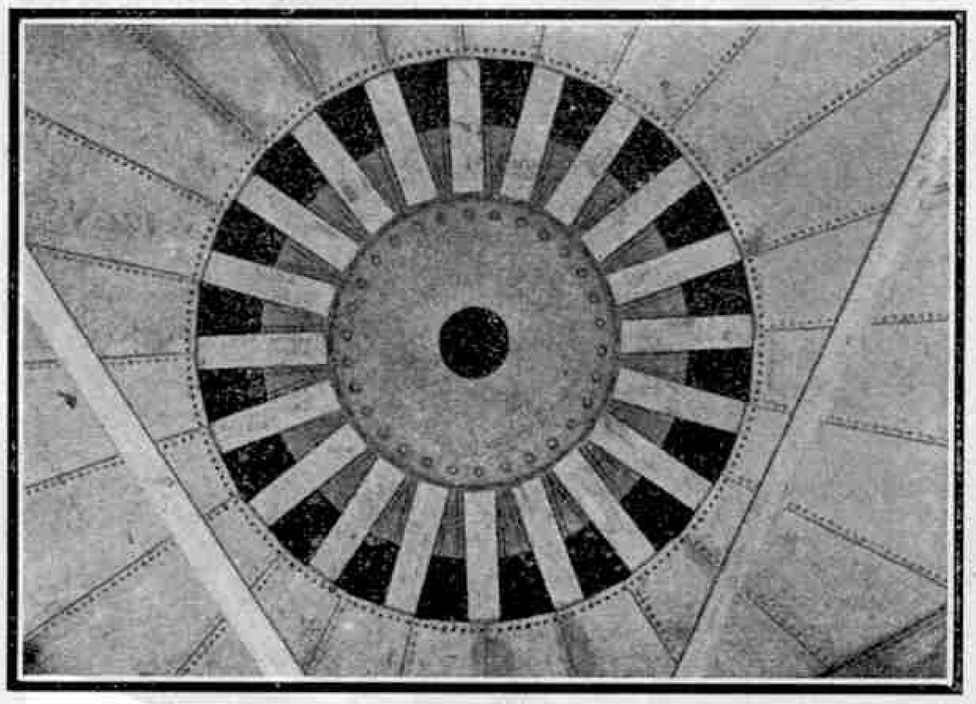
There is a story to the effect that a little more than 100 years ago a certain young man resigned his position in the Patent Office on the ground that everything worth while had been invented and that the Patent Office probably would be closed down for lack of work! I wonder what this young man would think if he could visit the Patent Office to-day. Since his retirement many millions of ideas have been submitted, and almost every year sees the establishment of a new record in the volume of business that it transacts. During 1929 no fewer than 39,898 applications for patents were filed at the British Patent Office—the highest number ever recorded—and the stream of inventions is even greater in the United States, where the average number of applications is about 85,000 a year.

This youth had not realised that inventors are ever looking for new worlds to conquer. At the very time when he expected the Patent Office to close, George Stephenson and his colleagues were engaged on the construction of the Liverpool and Manchester Railway—the event celebrated in Liverpool last month by the Pageant described on page 762—and were thus opening up a field that has been remarkably prolific in inventions. A little later came the wonderful development of electricity, which has led to the taking out of innumerable patents covering telegraph instruments, telephones, dynamos, motors and countless other instruments and machines that were then undreamed of. In other directions also inventors have displayed amazing activity and, as the figures I have already given show quite plainly, this activity is continually increasing. It is safe to say that to-day no employee in the Patent Office has the slightest fear that his occupation will come to an end for lack of inventions, for men are now keener than ever to discover new things and to find new uses for old ones.

How Inventions Grow

An invention seldom springs to life in complete perfection, but grows slowly as improvements are made by the originator, or by others working on similar lines. One invention leads to others, and in the final form of any instrument or machine it is often difficult to recognise clearly the idea behind the crude example that forms the subject of the earliest patent connected with it. The telephone is an excellent instance of this. To-day this instrument enables us to express ourselves over great distances with such ease that we cannot imagine a time when it was necessary to shout through a narrow mouthpiece that also was used as an earphone, and when several repetitions often failed to convey an intelligible message to the harassed listener at the other end.

No. 23. WHAT EVER IS IT?



Here is the twenty-third puzzle in the popular series of mystery photographs. Can you identify this mysterious object?

To the first reader to send an exact answer or, if nobody is successful in this, to the one who gets nearest, I will send an autographed copy of my book "Engineering for Boys."

Solutions should be written on postcards only and addressed "Editorial Competition, No. 23, 'Meccano Magazine,' Old Swan, Liverpool." Closing date, 30th September.

From Quill to Typewriter

It is a curious coincidence that the steel pen came into general use in the year that saw the beginning of the Iron Road. The introduction of the railway greatly speeded up communications, and in a similar manner the use of the steel pen quickened correspondence and led to an enormous saving in time.

I wonder how many of my readers who dip their pens in their inkwells and proceed to write letters to their friends, or to carry out their nightly homework tasks, ever stop to consider the difficulties that were encountered in the simple act of writing before 1830, when steel pens made by machinery at Birmingham first became available in large quantities. The Greeks and Romans scratched their letters on a prepared wax surface by means of the sharp point of a stylus. One advantage of this cumbersome means of writing was that mistakes could easily be corrected, for all that was necessary was to smooth out the wax once more with the blunt end of the writing instrument!

In the Middle Ages there came into use the quill pen, made from a feather nicely shaped and pointed. In those days writing was an art, and good writers used only the very best quality of feathers, such as those of the swan and the turkey. For specially fine writing crow quills were largely used.

The difficulty with quill pens was that after one had been used for a short period it had to be cut and shaped once more, a task that required a considerable amount of skill. Efforts were made to increase the durability of the quills by attaching horn or tortoise-shell to the points, or even by gilding them, but these efforts were only partially successful. The superiority of the steel pen brought it into general favour soon after it was introduced. It made writing much easier and speedier, but there are some who think that the matter written has suffered in consequence. They argue that it was while re-shaping the points of their quills that the authors who lived and wrote before the introduction of the steel pen pondered over their subjects!

September Mystery Photograph

The twenty-second Mystery Photograph proved to be one of the most intricate puzzles of the series. If any evidence of the fertility of imagination of Meccano boys were required a perusal of the entries received would supply it, for the solutions varied from vices and sparking plugs to furnace doors and—best of all—"a view through a locomotive cab window." At the time of going to press only twelve readers had identified it as the X-ray photograph of a ring in its case. The first correct solution received was from A. R. Russell, Glasgow, to whom an autographed copy of my book "*Wonders of Engineering*" has been sent.

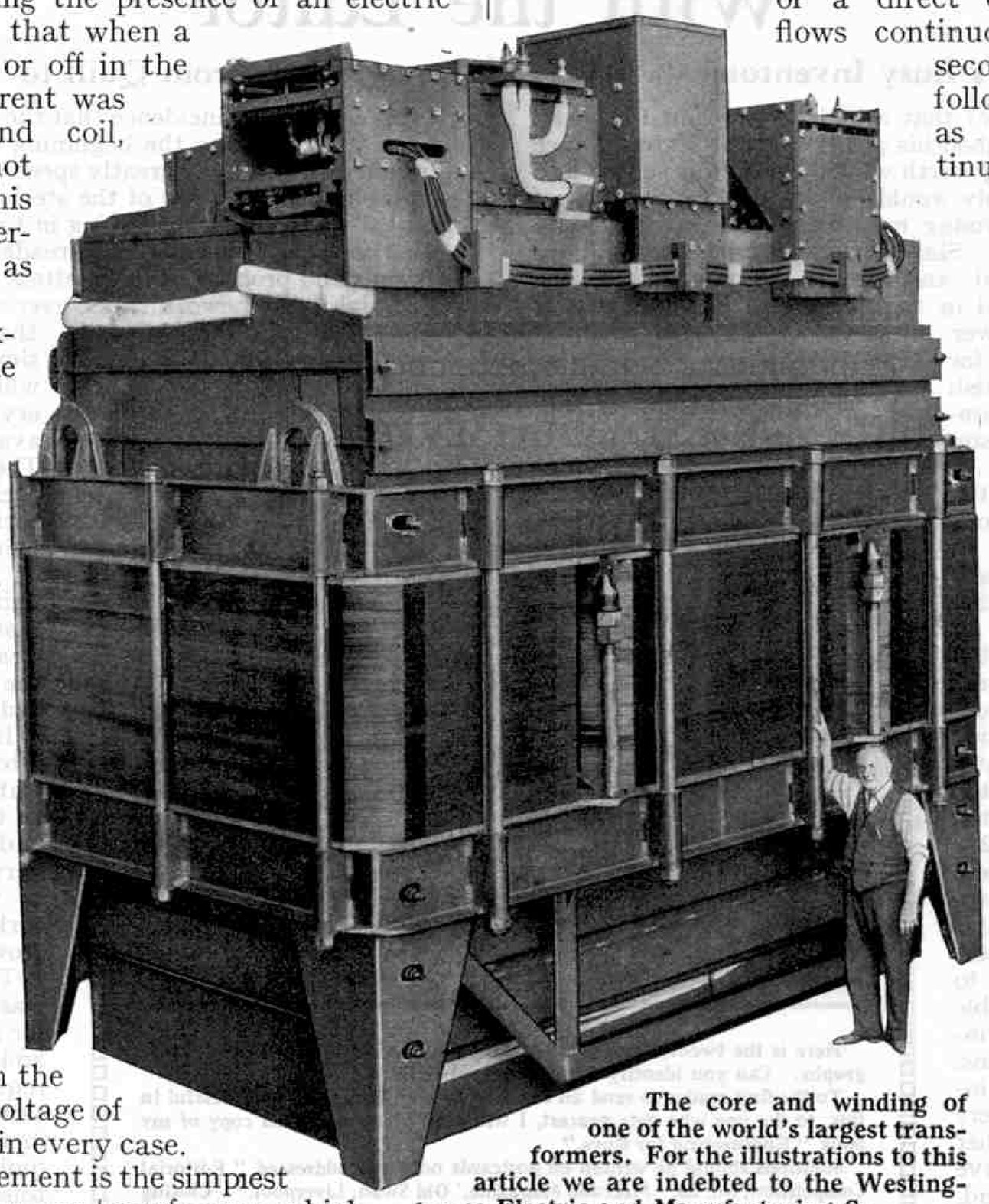
The World's Largest Transformers

Vast Developments from Simple Experiment

THE great English scientist Faraday, the founder of the world's electrical industry, in one of his early experiments wound upon an iron ring two insulated coils of wire each consisting of many turns. The first coil was connected to an electric battery circuit, and the second to a galvanometer, which is an instrument for detecting the presence of an electric current. Faraday found that when a current was switched on or off in the first coil a secondary current was generated in the second coil, although the two were not connected in any way. This secondary current is generated by a process known as induction.

If the two coils in this experiment each consist of the same number of turns of wire, the secondary current will be of the same voltage as the original current; but if the secondary coil has twice as many turns as the primary coil the secondary current will have twice the voltage of the primary current. On the other hand, if the secondary coil has only half as many turns as the primary, the voltage of the secondary current will be only half that of the primary current. This relation between the number of turns of wire in the respective coils and the voltage of their currents holds good in every case. Faraday's two-coil arrangement is the simplest form of an apparatus known as a transformer, which enables us to transform the voltage of an electric current up or down according to the manner in which we adjust the relation between the respective coils.

It is important to remember that the increase or decrease in the voltage or pressure of a current obtained by means of a transformer is always accompanied by a corresponding change in the amperage or rate of flow of the current. For instance, if we have a current of 100 amperes at 100 volts, and we increase the voltage to 1,000, the amperage will be decreased to 10; or if we decrease the voltage to 10, the amperage will be increased to 1,000. Whatever change in voltage and amperage the transformer brings about, it gives out exactly the same total energy that is put into it, less a very small loss that takes place in the process of transforming.



The core and winding of one of the world's largest transformers. For the illustrations to this article we are indebted to the Westinghouse Electric and Manufacturing Co.

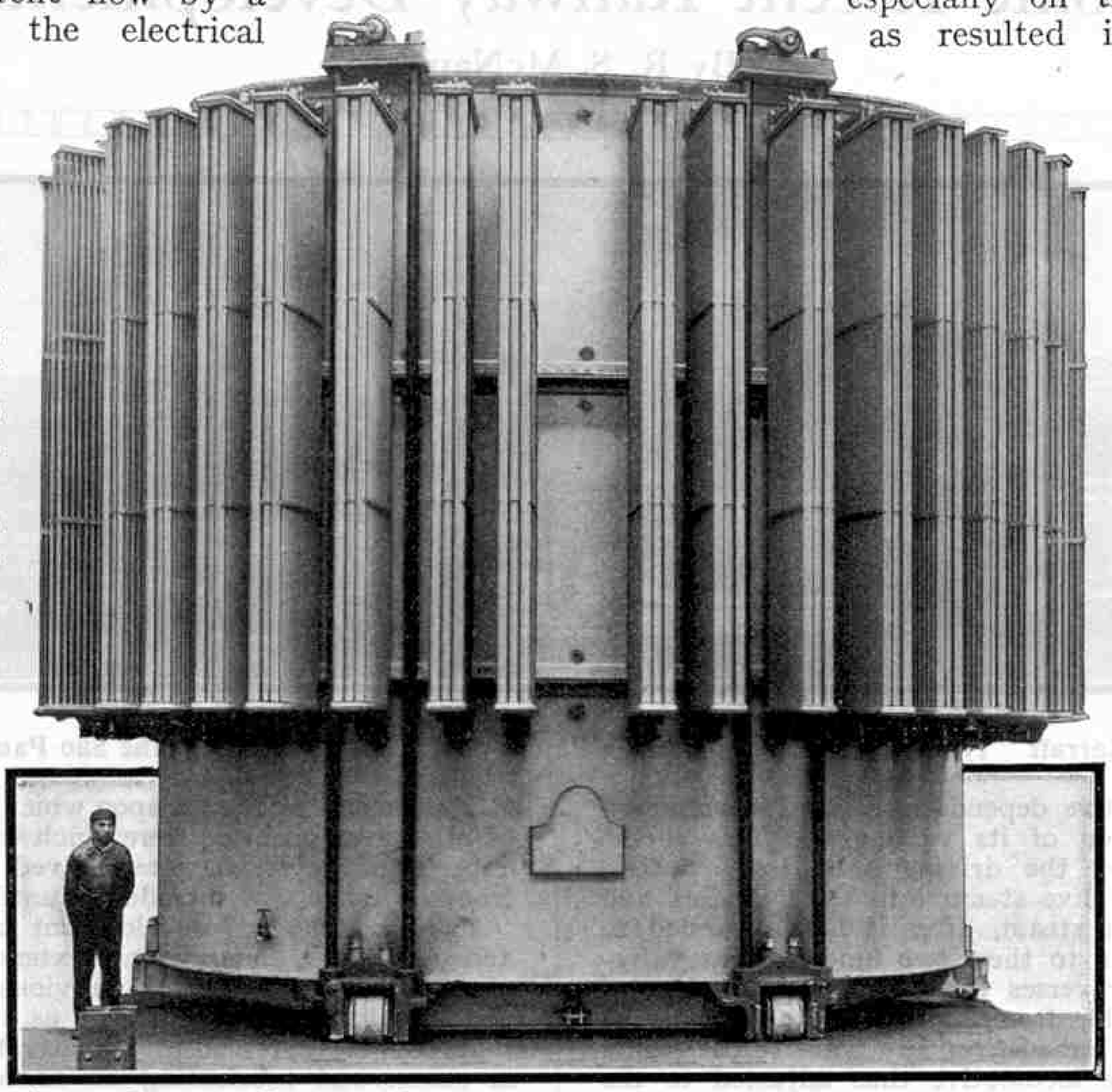
We have seen that in Faraday's experiment a secondary current was generated only when the primary current was started or stopped, no secondary current being generated while the primary current continued to flow. This is the case with all transformers. With direct current such as that given by an accumulator or a direct current dynamo, which flows continuously in one direction, secondary currents that follow one another so rapidly as to be practically continuous can be obtained by the use of a mechanical arrangement that starts and stops—or as we say makes and breaks—the primary current at extremely rapid intervals. Such an arrangement is used in what are known as induction coils, which transform a low voltage current to one of the enormously high voltage required for X-ray work and other purposes. It is not with direct current, however, but with alternating current, that the transformer finds its most important commercial use. Alternating current does not flow continuously in one direction but reverses its direction at a very rapid rate; and when such current is used in a transformer each reversal in the primary coil generates a current in the secondary coil. With alternating current, therefore, no making and breaking arrangement is necessary as is the case with direct current.

Electrical power is measured in watts. In the case of direct current the number of watts is obtained by multiplying together the voltage of the current and its amperage. Therefore, so long as the product of voltage and amperage remains the same, it makes no difference so far as electrical power is concerned whether the current is of low voltage and high amperage, or high voltage and low amperage. With alternating current the calculation of the watts is not quite so simple as with direct current, but the same principle holds good.

When a current is transmitted through a long cable

a considerable amount of loss occurs through the heating of the cable. This heating is due to the current flow or amperage, not the pressure or voltage; and therefore the heavier the current the greater the loss. From this it will be seen that by increasing the pressure and decreasing the current flow by a corresponding amount, the electrical power will remain the same, yet at the same time the loss in transmission will be greatly reduced. It also follows that the use of current at high pressure and low amperage allows of the use of cables of smaller cross-section, and thus effects a great saving in copper.

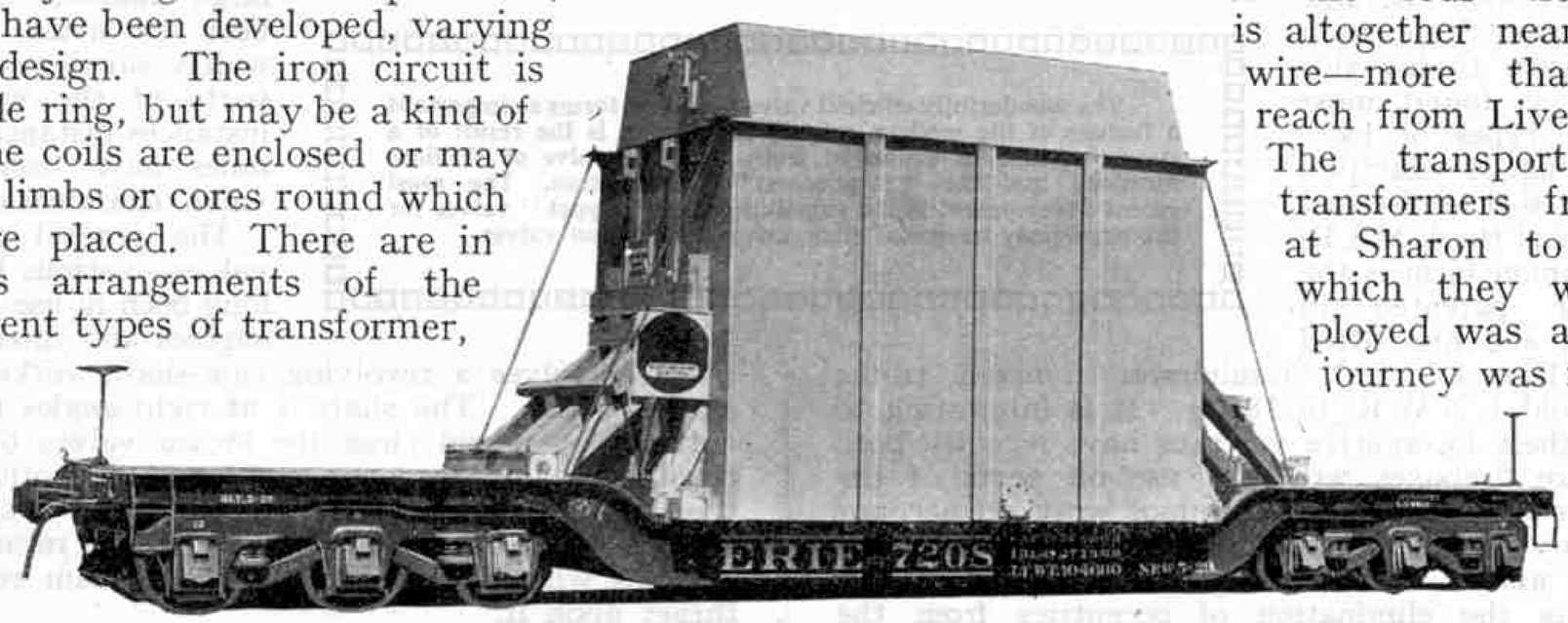
Alternating current is now used in all but the smallest systems of electrical power distribution. It is easier to generate alternating current than direct current at high pressures, and whereas it is easy to transform alternating current up or down as required, the corresponding process with direct current is complicated. The procedure in the average large distribution system is first to generate alternating current at a moderately high voltage; then to transform this current to an extremely high voltage for transmission along the main power lines; and finally to transform this high voltage current down to a voltage suitable for industrial and domestic purposes.



A complete transformer. Some idea of its enormous size may be obtained by comparison with the height of the man standing alongside.

Modern transformers all operate upon the same principle as Faraday's ring and coil experiment, but many types have been developed, varying considerably in design. The iron circuit is no longer a simple ring, but may be a kind of shell in which the coils are enclosed or may take the form of limbs or cores round which the windings are placed. There are in addition various arrangements of the windings in different types of transformer, but the principle of operation is the same in every case. While a transformer is in operation a considerable amount of heat is developed, and if the temperature rises beyond certain limits the insulation of the coils deteriorates rapidly. Some cooling arrangement is therefore necessary. Transformers of large capacity, which may have to carry considerable overloads for brief periods, are usually cooled by immersing the cores and windings in a tank containing oil. The heat imparted to the oil is carried by circulating currents to the sides of the tank and radiated into the air. The dispersion of the heat may be assisted by means of an air blast, or by cooling water circulated through pipes arranged in spirals inside the tank.

The enormous expansion of electric power systems, especially on the American continent, as resulted in the development of transformers of immense size. The largest made o far were four completed last year by the Westinghouse Electric and Manufacturing Company at their works at Sharon, Pennsylvania, for an electric light and power company in New Jersey. Their winding capacity is sufficient to furnish power to illuminate six million 40-watt lamps; that is enough lamps to suffice for 200,000 ordinary six-roomed houses! Each of the transformers is 35 ft. in height, weighs approximately 300 tons, occupies a floor space of 22 ft. by 23 ft. and requires 32,000 gallons of oil to fill it. The rating of each is 220,000 volts, but they were actually tested at 570,000 volts, which is the highest test voltage ever applied to a power transformer. The severity of this test indicates the great margin of safety that is provided in modern electrical equipment. The cores in each transformer are built up of laminations containing 63 tons of the special alloy employed, and the windings consist of 15 tons of copper wire. In the windings of the four transformers there is altogether nearly 130 miles of wire—more than sufficient to reach from Liverpool to Dublin!



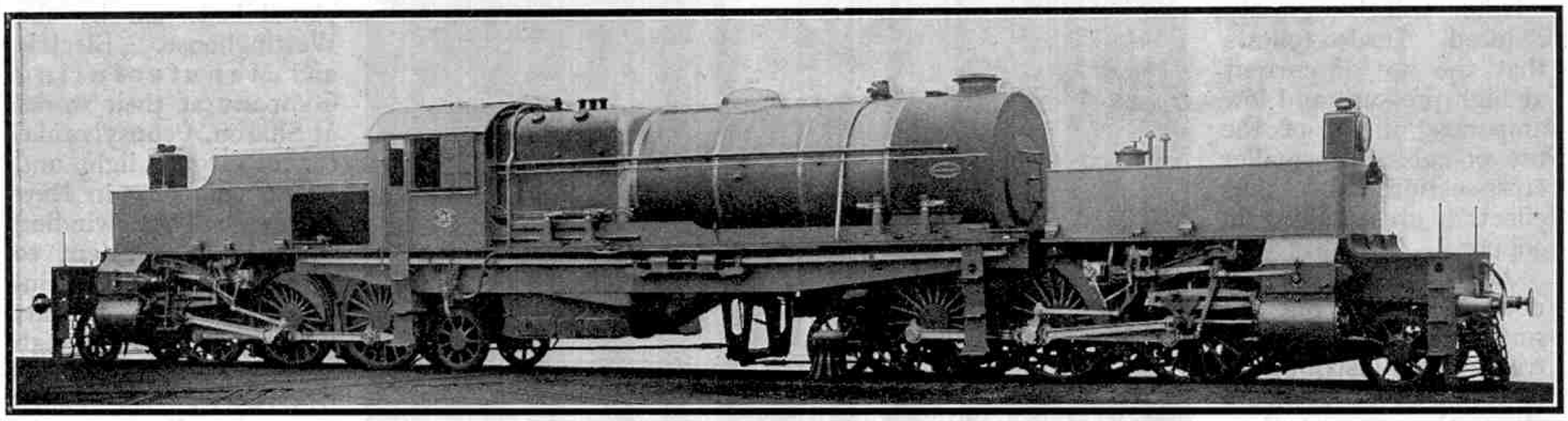
A transformer loaded on one of the immense well-type wagons specially constructed by the Erie Railroad for the transport of the four from Sharon, Pennsylvania, to New Jersey.

The transportation of the transformers from the works at Sharon to the station at which they were to be employed was a big task. The journey was made by way of the Erie Railroad, and the load was such as to require the strengthening of various bridges, and the lowering of the railways tracks no less than 18 in. at one point in order to provide sufficient clearance. A small army of men was required to prepare the huge transformers for their journey and to load them on to their trucks. First of all the whole of the oil contained in the transformers was drained out, and it more than filled three tank wagons. The transformers were then packed in specially designed tanks, which were filled with *(Continued on page 808)*

Poppet Valves for Locomotives

Some Recent Railway Developments

By R. S. McNaught



Courtesy] [*Beyer, Peacock & Co. Ltd.*

One of the 2-6-2 + 2-6-2 " Garratt " type locomotives with Lentz Patent poppet valves, built for the Sao Paulo Railway, South America.

THE efficiency of a locomotive depends to a large extent upon the design and operation of its valve-gear. This is the mechanism, actuated by the driving axle, that controls and adjusts the admission of live steam into the cylinders and the expulsion of the exhaust steam, after it has expanded to move the piston. In addition to these two functions the valve-gear is so designed that it reverses the direction of motion of the engine, and is also variable from the foot-plate so that the supply of live steam can be " cut off " at any point of the piston stroke, and the effort of the locomotive thus adjusted to the necessities of the moment. An apt way of expressing the last function is to describe the valve-gear operated through the reversing lever or screw, as corresponding to the three-speed gear of a bicycle or the gearbox of a motor car.

The ordinary slide-valve, the invention of which is generally attributed to William Murdock, a pupil of James Watt, was in almost universal use for locomotives until comparatively recent times. Such valves were generally worked by the primitive " gab " motion until, in 1842, William Howe invented a shifting link motion worked by eccentrics. It was fitted to the locomotives built by the famous firm of Robert Stephenson and Company, and soon became generally adopted as the "Stephenson Link Motion." Even to-day this form of valve-gear is found most suitable for certain types of locomotives, recently-designed examples being the standard 0–6–0 tender and shunting tank classes of the L.M.S.R.

The wonderfully efficient valve-gear that forms so important a feature of the modern railway locomotive is the result of a steady process of evolution from the slide valve of William Murdock and the " Stephenson " link motion. The most recent development is the substitution of " poppet " valves for the previously universal slide valves and piston valves.

Another very common form is the "Joy's" valve-gear patented in 1879 by David Joy, and first fitted to the familiar " 18-inch " or " Cauliflower " mixed traffic locomotives of the old L.N.W.R. in 1880. It is interesting to note that many of these locomotive veterans have recently been rebuilt with Belpaire fireboxes, etc., for use on parts of the L.M.S. system where the newer classes cannot work on account of their weight. Joy's gear was adopted as standard by the L.N.W., G.E., N.E., and L. & Y. railways for many years. Its chief advantage was the elimination of eccentrics from the driving axles, which allowed bigger bearings, and its general simplicity. It is also lighter than the link motion.

On the Continent, and to some extent in America, the favourite form of valve motion has long been the one invented in 1844 by a Belgian engineer named Walschaerts. It was not generally adopted in this country until the present century, when the outside cylinder system came back into popularity with locomotive designers. In its favour was the discarding of slide valves for piston valves working in steam chests above or below the cylinder proper, and with various improvements and slight modifications the Walschaerts gear is much in use for modern locomotives employing superheated steam and piston valves.

The general principles upon which each of the foregoing systems of valve-gear operated were much the same, and although various experimental systems were evolved from time to time, no fundamental change was introduced until comparatively recent years.

The most modern development in valve-gear for locomotives, and one that is being widely extended, involves the substitution of poppet valves for the previously universal slide valves and piston valves. It is claimed, as the result of extensive tests, that poppet valves ensure greater freedom in running, economy in steam and lubricating oil consumption, and less wear and tear; resulting in a big decrease in the repairs bill.

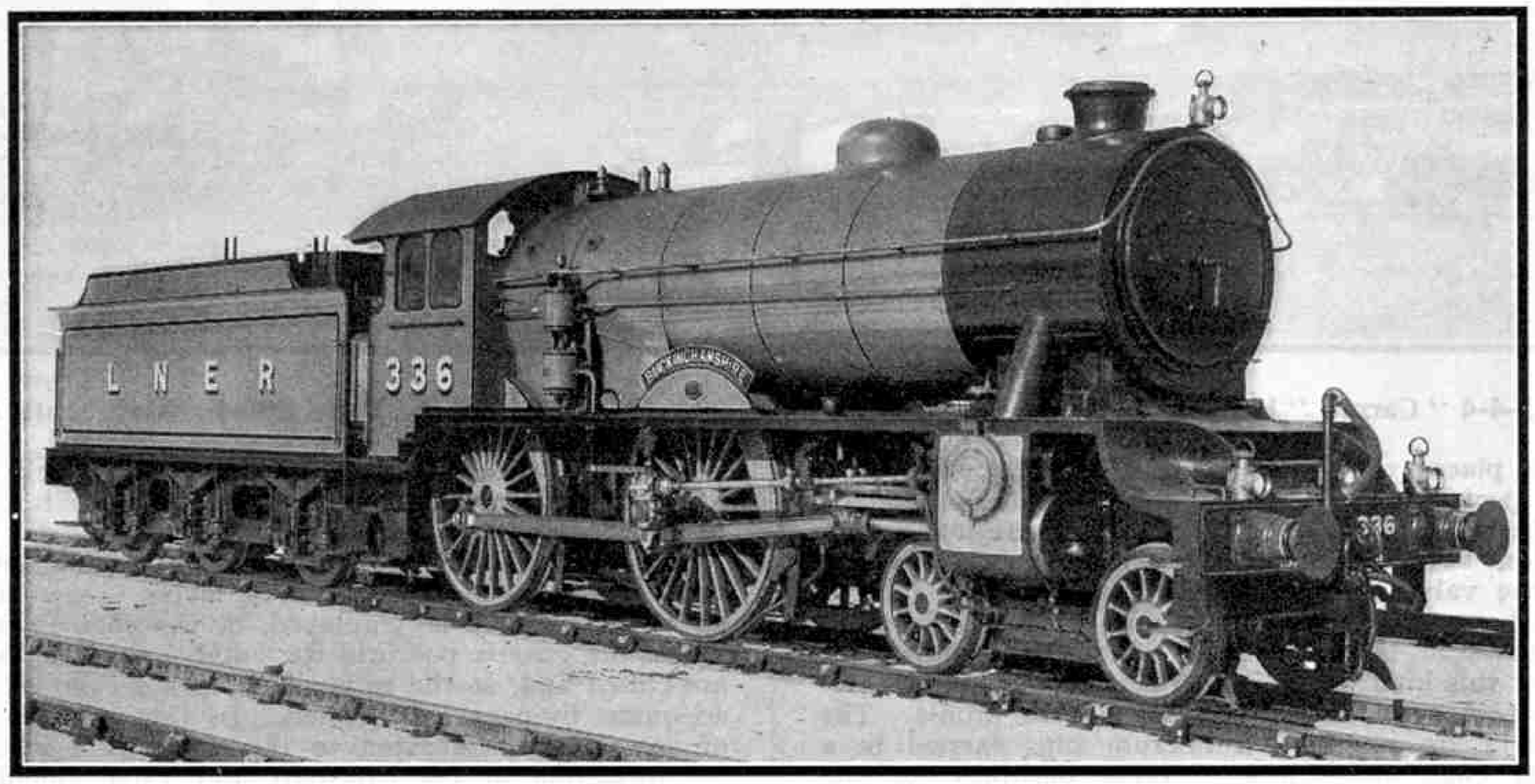
Poppet valves have been introduced most extensively by the firm of Lentz Patents Ltd., of London. The system dates back to 1907, when a locomotive of the Oldenburg State Railway, Germany, was fitted with vertical poppet valves. It was found possible to operate the valves by the ordinary Walschaerts gear, and the success of the experiment led to further improvement, the position of the valves being altered to the horizontal in order to conform with ordinary locomotive requirements. In this form the Lentz Patent Valve System was first applied in 1922 to locomotives of the Austrian Federal Railways, and since then large numbers of locomotives have been so fitted for working under widely varying conditions in different parts of the world. In certain instances distances as great as 65,000 miles have been run without any valve examination being necessary.

The general principle of poppet valves—various forms of which have long been in use for stationary steam engines and internal combustion engines—involves a revolving cam-shaft worked from the motion of the engine. The shaft is at right-angles to the spindles that actually open and close the steam valves of the cylinder. Its revolving cams transmit an outward motion to the spindles, thereby causing the latter to compress a spring in which the spindles are set and thus facilitating the return movement of the spindles when the revolution of the cam releases the outward thrust upon it.

In the Lentz system there are four valves for each cylinder, two controlling the admission ports and two the exhaust ports. The four valves are disposed in groups, two at each end of the cylinder, one admission valve and one exhaust valve together. As all four valves are set in the horizontal plane their centres and spindles are parallel, and the spindle ends remote from the valves meet in a common chamber called the " cam space," which is formed in the centre of the valve chamber casting. The cam-shaft runs in the cam chamber at right-angles to the valve spindles, and on it are mounted two cams, one operating the live steam and the other the exhaust valves. The cams either make direct contact with the spindles or, more especially in the

case of locomotives intended for fast running, intermediate levers between the cam discs and the spindle ends are employed, mounted on suitable fulcrum supports. This method allows of the employment of lighter valve spindles.

The outer end of the cam-shaft is keyed to a short lever from which a connecting link couples it to the valve-gear. A poppet-fitted locomotive is reversed in the usual manner, and expansive working is accomplished by the notching-up of the valve-gear through the reversing rod in the ordinary way, although with poppet valves the steam port openings are improved for any given running conditions. This, together with the improvement obtained by the more direct passages, especially for the exhaust, greatly reduces loss of efficiency due to the throttling of the steam in the ports and passage ways. Thus is solved a problem that for many years has worried locomotive designers.



Courtesy] [*L.N.E.R.*

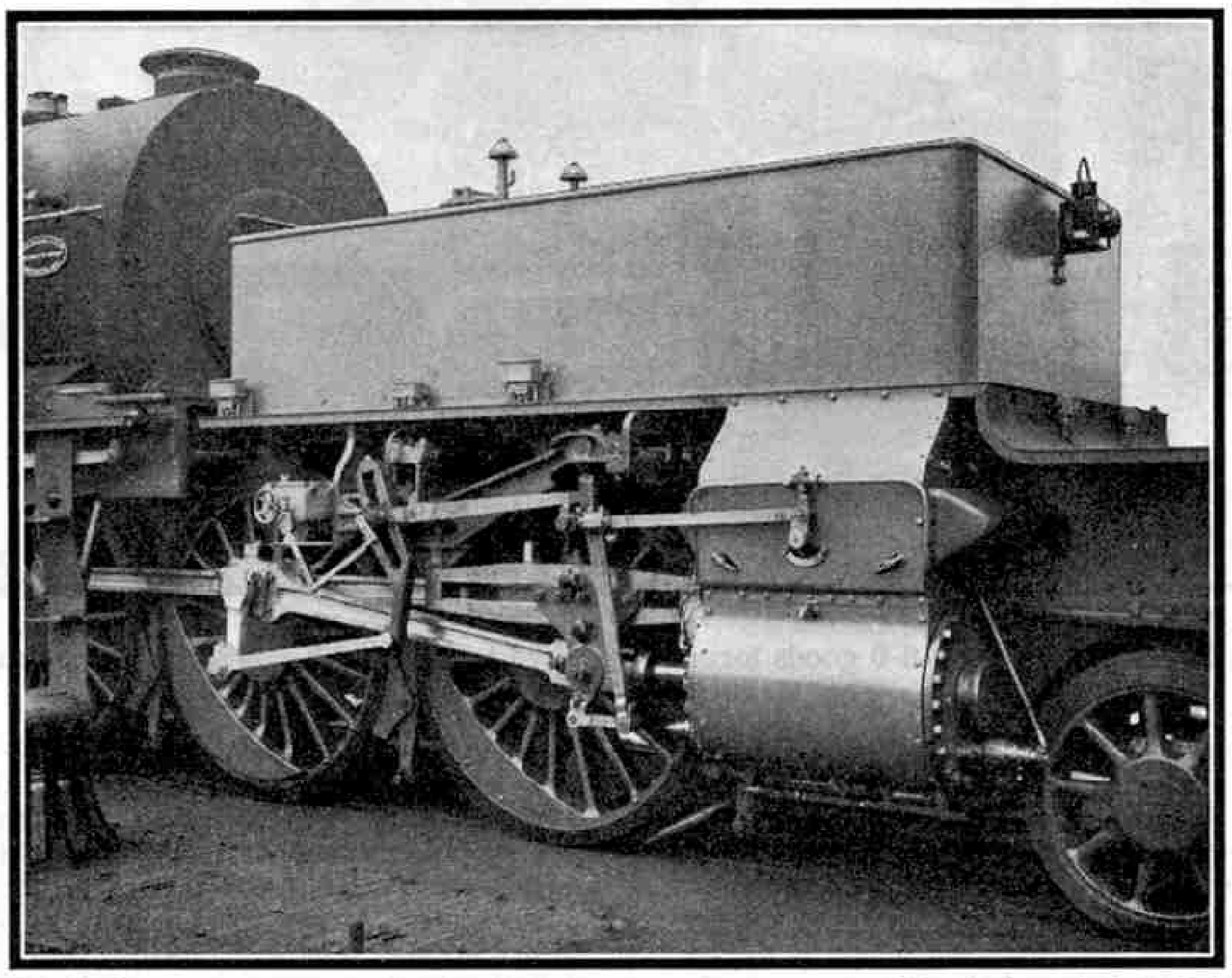
Three-cylinder 4-4-0 express locomotive, No. 336, "*Buckinghamshire*," fitted with Lentz rotary cam poppet vavle-gear. Recently this locomotive has been working with an indicating shelter fitted.

The first locomotive in this country to be fitted with Lentz poppet valves was a large-boilered 0–6–0 goods locomotive of the Great Eastern section of the L.N.E.R. In this instance the poppet valves are actuated by Stephenson's link motion. The two inside cylinders are 20 in. in diameter with a stroke of 28 in., and the eight poppet valves have each a diameter of 6 in. Lubrication for the cylinders and valve spindles is by a Wakefield mechanical lubricator, but no oil is fed into the steam pipes. This engine has been in constant service since May, 1925, without repairs of any kind being needed to the valve-gear or motion. It has worked heavy mineral, and also fast goods trains, with every success and economy.

On the same line, the extremely arduous express passenger work is largely performed by the well-known inside-cylindered 4–6–0's which, in spite of limited dimensions owing to bridge and other restrictions, have a fine reputation for power and smart working. No. 8516 of this class was equipped with Lentz gear in 1926. Unlike the goods engine just referred to, the valve chests and the inside cylinders are formed in one casting, and separate steam and exhaust valve seatings are provided. In making the change, all that was necessary in connection with the Stephenson link motion was the extension of the rocking-lever fulcrums on each side through the main frames, and the provision of a suitably bushed bearing secured to the frames. This express locomotive also has performed noteworthy work on heavy main line expresses since the change. The chief dimensions of this class are :—Cylinders, 20 in. × 28 in ; six coupled wheels, 6 ft. 6 in. diameter ; steam pressure, 180 lb. per sq. in ; total heating surface, 1,919 sq. ft. ; weight, with tender, 101.25 tons, 44 tons being available for adhesion.

Ten entirely new locomotives of the same general type have recently been placed in service on the Great Eastern section. The only important differences between them and the original "1500" class of 1912 are the provision of an extended smokebox, raised outside plating to give ready access to the coupling rod crankpin lubricators, and the substitution of Lentz valves, with direct outside valve rods, for the piston valves. The new locomotives, Nos. 8570-9, are doing very satisfactory work on the most arduous duties.

Two 4–4–0 type three-cylinder express passenger locomotives, Nos. 336 "*Buckinghamshire*," and 352 "*Leicestershire*," built at the L.N.E.R. Darlington Works, have been fitted with rotary cam poppet valve gear supplied by Lentz Patents Ltd. This arrangement consists of a camshaft that obtains a rotary motion by means of suitable gears and shafting, so arranged that the rotation of the camshaft can be synchronised with that of one of the coupled axles.

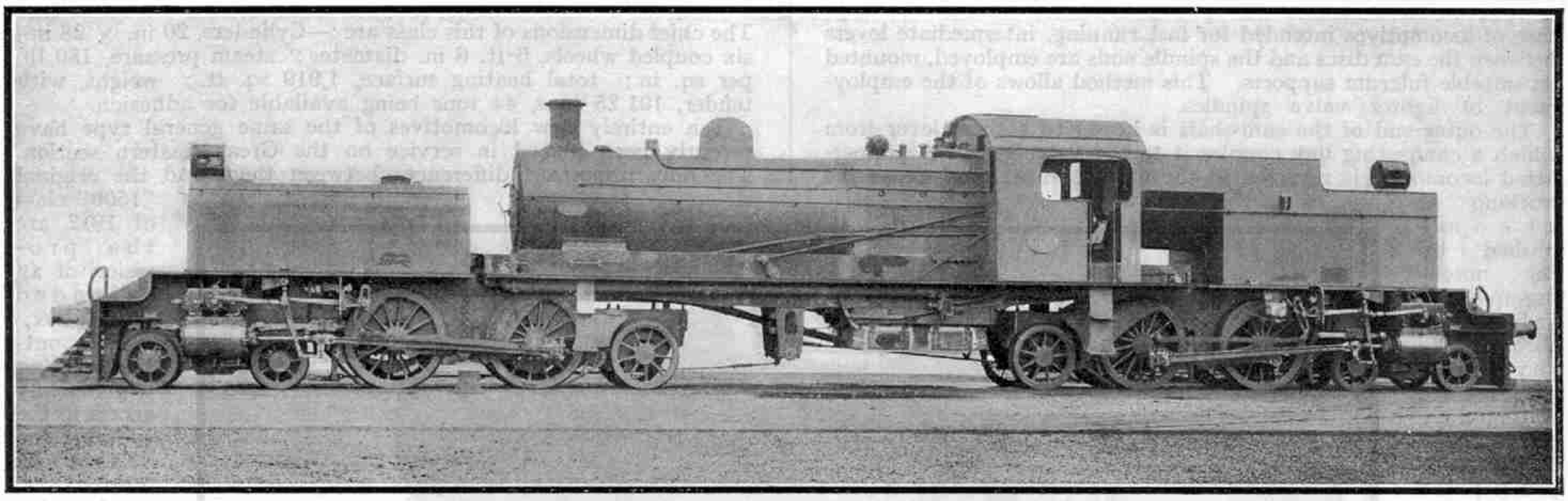


Courtesy] [*Beyer, Peacock & Co. Ltd.*

The motion of the Sao Paulo Railway "Garratt," showing the Lentz valves actuated by Walschaerts valve-gear.

In these two locomotives the camshaft is placed above the cylinders with its axis at right-angles to the horizontal centre line of the locomotive. It is of high tensile steel, and has mounted on it specially-formed stepped cams that control both the steam admission and the exhaust valves for each of the three cylinders. The steam inlet cams for each cylinder are made in two separate sections. Those for forward gear running provide for five different rates of steam admission, ranging from a minimum cut-off of 15 per cent. to a maximum of 75 per cent. in full gear. For back gear running a further group of cams is used giving two rates of admission, one for full gear, and the other giving a shorter rate of cut-off of 35 per cent. There is also a cylindrical cam for each cylinder to close the steam valves when the engine is placed in mid-gear, the exhaust valves then being held open by a similar cam of larger diameter in the exhaust set.

The exhaust cams are designed in such a manner that in full gear the point of compression starts later than with shorter admission rates, thus allowing free exhaustion of the steam, and assisting in starting. The point of release takes place at 90 per cent. in full gear and 80 per cent. for all other cut-offs.



Courtesy] [*Beyer, Peacock & Co. Ltd.*

A 4-4-2 + 2-4-4 " Garratt " locomotive, fitted with Lentz Patent poppet valves, built for the Entre Rios Railway, South America.

The valves are placed with their axes in the horizontal plane, an arrangement specially adapted for engines with inside cylinders, and rendering the valves easily accessible. There are four valves for each cylinder, two admission and two exhaust. Between the cams and the valve spindles are intermediate levers fitted with rollers that bear against the cam profile. This arrangement enables the spindles to be made light, which is an important point in a gear of this kind; and it also permits the use of comparatively large port openings for any given cam profile. The intermediate levers are pivoted on fulcrum pins carried in a circular cast-iron cage fitted with suitable bushings for the bearings that support the camshaft. The caging is arranged in a circular cavity extending the whole width of the cylinder castings.

At one end of the camshaft is keyed a driving dog fitted in a hollow sleeve, in the bore of which are cut key ways engaging with projections formed solid with the driving dog. At one end of the sleeve, on its outer periphery, is keyed a spiral bevel wheel. This arrangement allows of the rotation of the camshaft by means of the driving dog, at the same time permitting the shaft to be moved in an axial direction for reversing. The spiral bevel is driven by another bevel wheel keyed to a shaft carried in a suitable bearing formed in the gear casing.

Extending backward outside the locomotive is a length of shaft carried by a bearing bracket fitted with ball bearings and fixed to the right-hand outside cylinder slide-bar bracket. From this point there is another length of shafting fitted at both ends with Hardy-Spicer universal joints, a fixed joint being used at the front and a sliding joint at the rear.

The main driving gearbox consists of two spiral gears mounted in a dust-proof oil-tight casing. The main driving wheel is keyed to a return crank arranged so that the axis of the pin corresponds with that of the main driving axle. The gearbox is fitted throughout with ball bearings, and is held in position by an anchor link secured to the top of the casing and to a bracket attached to the side footplating.

The reversing gear consists of a hand wheel in the cab, the spindle of which is coupled to a shaft carried along the boiler on suitable brackets to a bevel gearbox, from which a shaft extends downward to a self-locking gearbox fitted to the inside of the main frame, and containing a pair of spiral gears. From there a short shaft passes into the cylinder casting, on the end of which is keyed a pinion gearing with a rack running on the camshaft. By rotating the hand gear in the cab it is thus possible to move the camshaft transversely relative to the locomotive centre line, and thus bring any cam, as desired, into contact with the rollers on the intermediate levers. Any cut-off provided by the cams may be employed, or the engine may be reversed. When the gear is put into its " mid " position the steam valves are closed and, as the exhaust valves are held off their seats, an adequate by-pass is provided. In this position no movement of any kind is imparted to the valves and levers.

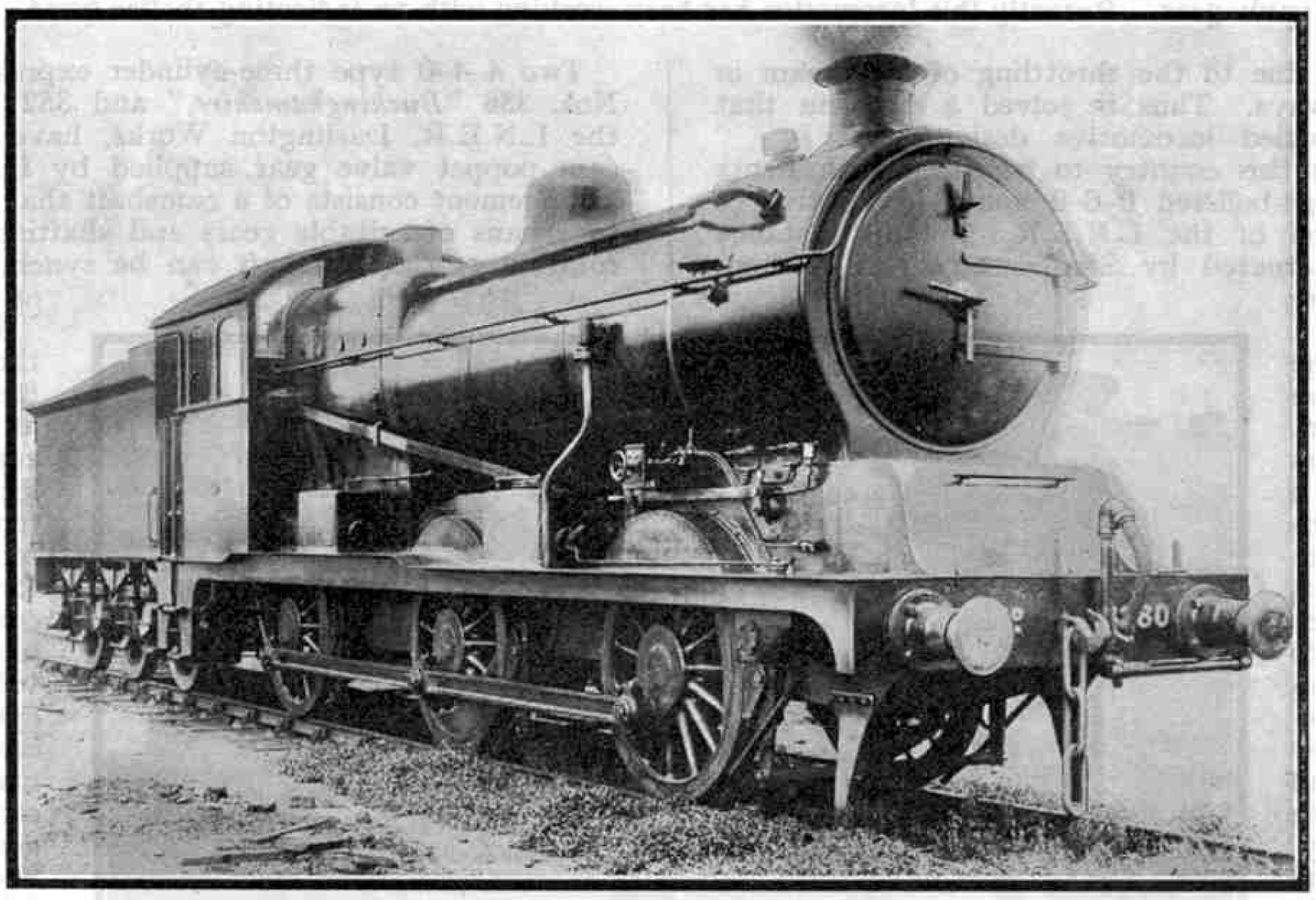
Lubrication of the camshaft and valve spindles is arranged for by a mechanical lubricator that connects to the camshaft bearings and the valve spindle bushes. An anti-carboniser attachment is provided.

The poppet valves remain steam tight over long periods, and when the engine is in mid-gear no steam escapes from the cylinder cocks when the regulator is opened wide and with steam at full working pressure.

In the engines thus fitted the weight at the front end is lower by about 1½ tons than is the case in the same type of engines fitted with piston-valve cylinders. This reduction in weight is due largely to the elimination of valve gear details and incidental parts.

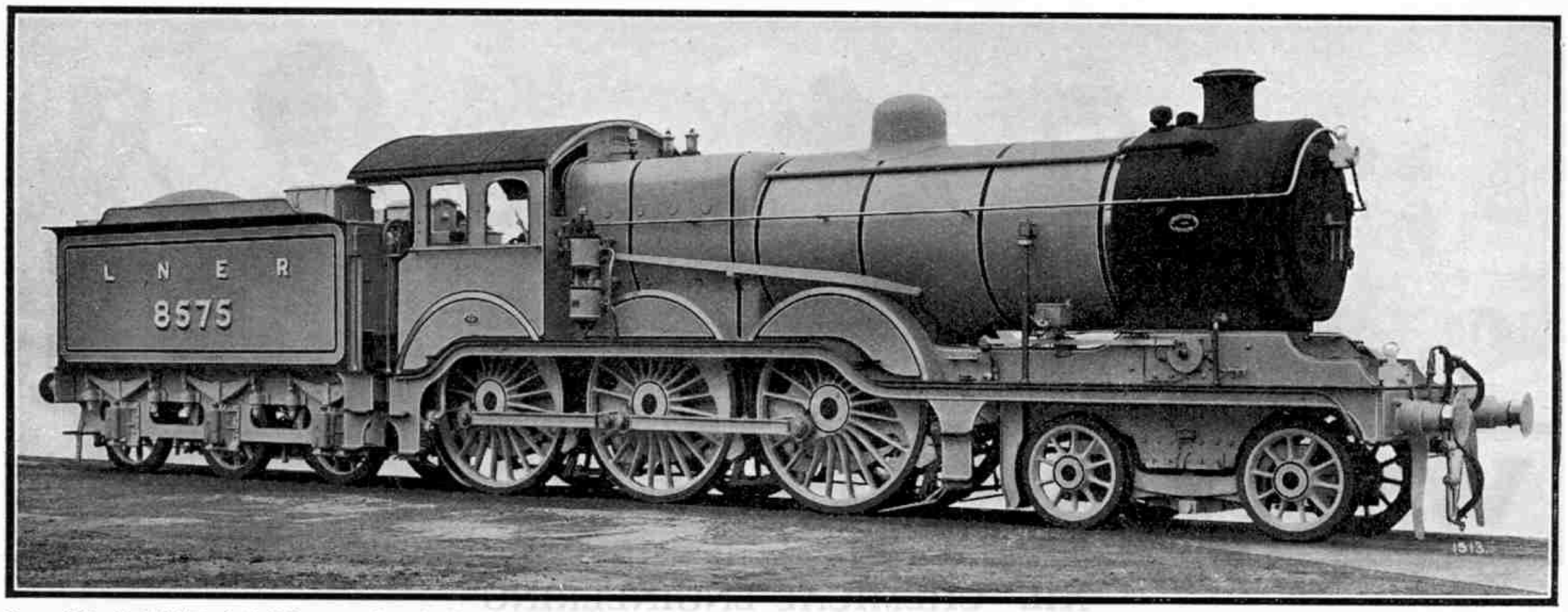
Lentz patent poppet valves have been fitted to a considerable number of locomotives built for service abroad and in the colonies. Two large " Garratt " type locomotives, built for the Rhodesian Railways in 1926 by Beyer Peacock Ltd., are so fitted. A striking feature is the cylinder design, which secures interchangeability between the Lentz-fitted " Garratts " and some others built at the same time, but fitted with piston valves. The gear is of the direct type, without intermediate levers. These large engines are of the 2–6–2 + 2–6–2 wheel arrangement, with four cylinders 16 in. × 24 in., and a total weight of 122¼ tons. The Rhodesian Railways have also 10 powerful 4–8–2 tender locomotives, built in 1926 by the North British Locomotive Company, fitted with Lentz valves. Both these tender engines and the above-mentioned " Garratts " have Walschaerts valve gear.

Six large " Garratts " of the 4–8–2 + 2–8–4 type, said to be the most powerful in the world, have been built by Beyer, Peacock Ltd., at Manchester for the Benguella Railways, and the same firm completed recently some 4–4–2 + 2–4–4 " Garratts " for the Entre Rios Railway, all being fitted with Lentz valves.



Courtesy] [*Lentz Patents Ltd.*

L.N.E.R. (G.E. section) 0-6-0 goods locomotive fitted in 1925 with poppet valves actuated by Stephenson's link motion.



One of the L.N.E.R. 4–6–0 locomotives built by Beyer, Peacock and Co. Ltd., fitted with Lentz valves, operated by ordinary Stephenson link motion. The camshaft is partially rotated by means of the rod appearing below the smokebox and boiler ; this rod is connected to the rocking lever shown which is driven from the valve motion.

Another form of poppet valve gear is employed in the "Caprotti" system, which was devised by a young Italian engineer and given an extensive trial on the Italian Railways some five or six years ago.

In 1926 "Caprotti" gear was fitted to one of the well-known four-cylinder 4–6–0 "Claughton" class of L.M.S. express locomotives, No. 5908, "*Alfred Fletcher*" (since rebuilt with a larger boiler). This locomotive was extensively tested on main line expresses between Crewe, Carlisle, and Euston, and for purposes of comparison a standard locomotive of the same class, No. 5917, was pitted against it. The coal consumed by the Caprotti locomotive during the period 1st January to 18th September, 1927, over a total distance of 33,543 miles, worked out to 46·212 lb. per mile. During the same period No. 5917 worked a slightly smaller mileage, but its coal consumption was 20.76 per cent. more than that of No. 5908. In addition, the poppet valve locomotive showed an economy of 50.8 per cent. in cylinder oil and 21 per cent. in motion oil.

The L.N.E.R. authorities have been impressed by the good results obtained from the L.M.S. Caprotti-fitted locomotives and have installed the system experimentally on two of the powerful four-cylinder express locomotives of the old Great Central system. Two 4–6–0 express locomotives of the Great Southern Railways (Ireland) are similarly fitted.

In this system of steam distribution the motion for actuating the valve-gear is derived from a bevel gear-wheel keyed to the main driving axle. This wheel drives another bevel fixed to a long shaft running to the front end of the engine, which in turn gives a rotary motion to a horizontal shaft arranged transversely above the cylinder. The latter shaft actuates a number of cams, which cause the poppet valves to open and close in proper sequence. For opening and closing the four valves of each cylinder, three cams are employed, two of which control the steam valves and one the exhaust. The profiles of these cams are such that, as they revolve, they cause the valves to lift and remain open for a pre-arranged period in proper sequence during each stroke of the piston.

Each set of cams for working one cylinder is arranged in a separate casing so as to enable it to be connected up to a similar casing mounted upon the adjoining cylinder. Four unit casings are required for a four-cylinder engine, as in the case of the "Claughton" class ; but only two for a two-cylinder design.

The gear for the most part runs in ball bearings, and the casings are oil-tight and dust-proof. Thus many causes of frictional trouble are eliminated, which makes for the increased efficiency of the locomotive that modern poppet valves undoubtedly promote.

A further system of steam distribution by means of poppet valves has been introduced on the Netherlands Railway. Two large 4–4–0 superheater express locomotives have been fitted with poppet valves actuated by oil under pressure instead of ordinary link or cam-shaft motion. Two oil pumps, with adjustable cut-off, driven by two eccentrics from the crank axle, furnish the necessary oil pressure for moving the poppet valves. These two locomotives are in everyday main line service and are reported to show astonishing results in respect of economy in coal and water consumption. This system is the invention of Mr. M. Mattern, an eminent Dutch engineer.

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What Shall I Be?—*(Continued from page 761)*

in such industries as the manufacture of soap, he will find work to do in the tropics or in the islands of the Pacific Ocean; and lastly he may even gratify any inclination he may possess for a life at sea by making use of his knowledge and abilities in the floating factories that now deal with the production of whale oil in polar seas. It will be seen that chemical engineering is a profession that offers great variety.

As in the case with other engineers an Institution has been founded in order to look after the interests of those engaged in the chemical industries. This is called the Institution of Chemical Engineers. It was founded in 1923, and is thus of more recent growth than similar professional Institutions that have already been referred to in these articles. As already explained, the reason for this is that it is only during the last few years that the profession has become sufficiently important in this country to warrant the existence of a separate organisation. The foremost representatives of the profession are numbered among its members, and those who intend to become chemical engineers should not fail to become members in the appropriate branch. Full details of the work of the Institution and of the qualifications necessary for membership may be obtained by writing to the Secretary, Abbey House, Westminster, London, S.W.1.



XII.—CHEMICAL ENGINEERING

THE demand that arose during the Great War for explosives, nitrates and fertilisers, dyestuffs and other chemicals led to an enormous increase in the quantity of these products manufactured in this country. In fact, the expansion was so marked that it is generally supposed that the profession of chemical engineering is a new one, comparable in age to that of aeronautical engineering. This is not quite the case. There were chemical engineers long before the outbreak of the War, or the foundation in 1923 of the Institute of Chemical Engineers. It is only during the last few years that it has attracted attention in this country, however, but it promises to become of increased importance and there is little doubt that for really competent practical men the prospects in it are very attractive.

In order to understand exactly what the profession of chemical engineering has to offer to those who enter it we may consider the general position of chemistry in the industrial world. A surprising number of our largest industries are essentially chemical in character. For instance, the extraction of metals from their ores and their preparation for use in engineering work really depend upon chemical changes. It is to the chemist working in his laboratory that we are indebted for the invention of new and economical methods of working in the production of metals, such as iron and steel, that have been known for ages; and we also owe to him the discoveries of aluminium, cobalt, nickel and other metals, the use of which promises to effect a revolution in engineering.

Another direction in which the chemist has rendered wonderful service is in showing how to make the best use of coal. His work in this field is a veritable romance. Formerly coal was either burned in an open grate—the most wasteful of all possible methods of using it—or was distilled in a crude sort of way in order to give an illuminating gas. During the second of these two processes tar and a liquor containing ammonia are produced. These were looked upon as nuisances, and the best that could be done with the tar, for instance, was to use it for making pitch. But diligent research work on the part of the chemist has been pushed so far that to-day the gas may almost be described as the least valuable of the many products obtained when the coal is distilled. An English chemist, Sir Wm. H. Perkin, showed the way in 1856 when he discovered how to convert the benzol contained in the tar into a mauve dyestuff. This was the first of an amazing number of synthetic dyes of every conceivable range of colour that now are produced on a commercial scale from this black and unpromising liquid. The ammoniacal liquor also has been put to useful purposes, for means of converting it into a valuable fertiliser have been discovered.

Hundreds of other instances could be given of the work of the chemist in founding great industries and in extending the scope of others, and it is scarcely too much to say that the entire fabric of our modern civilisation depends on him. Until comparatively recently his share in this work has been overlooked, however, and the task of working out in practice the chemical changes that he has perfected on a small scale in the laboratory has been left to the so-called practical man, the chemist himself having only been called in in order to check the progress of events by analysis of the intermediate and final products.

Of late years the necessity for efficiency has led to a widespread recognition of the importance of chemistry, which has almost achieved miracles in turning apparently waste products into valuable materials. A close alliance has been formed between the chemist and the man whose business it is to carry out operations on a manufacturing scale. The former has learned to consider his work from a practical standpoint, as well as from the purely scientific side; and on the other hand the man in the factory has recognised that he must take a broader view of the operations that he conducts and that he must be on the alert to take full advantage of the knowledge placed at his disposal by the chemist. The result of the union between the two interests has been an increase in the demand for chemical engineers, who may be described as those who have a thorough knowledge of the sciences involved in the chemical industries and are also capable of devising efficient means of carrying out chemical changes on the manufacturing scale and of superintending work on the plant that they have designed.

At present the chemists employed in various capacities in industry may be divided into three groups. The first of these consists of the analytical chemists. Their task is to analyse the

FAMOUS ENGINEERS—12



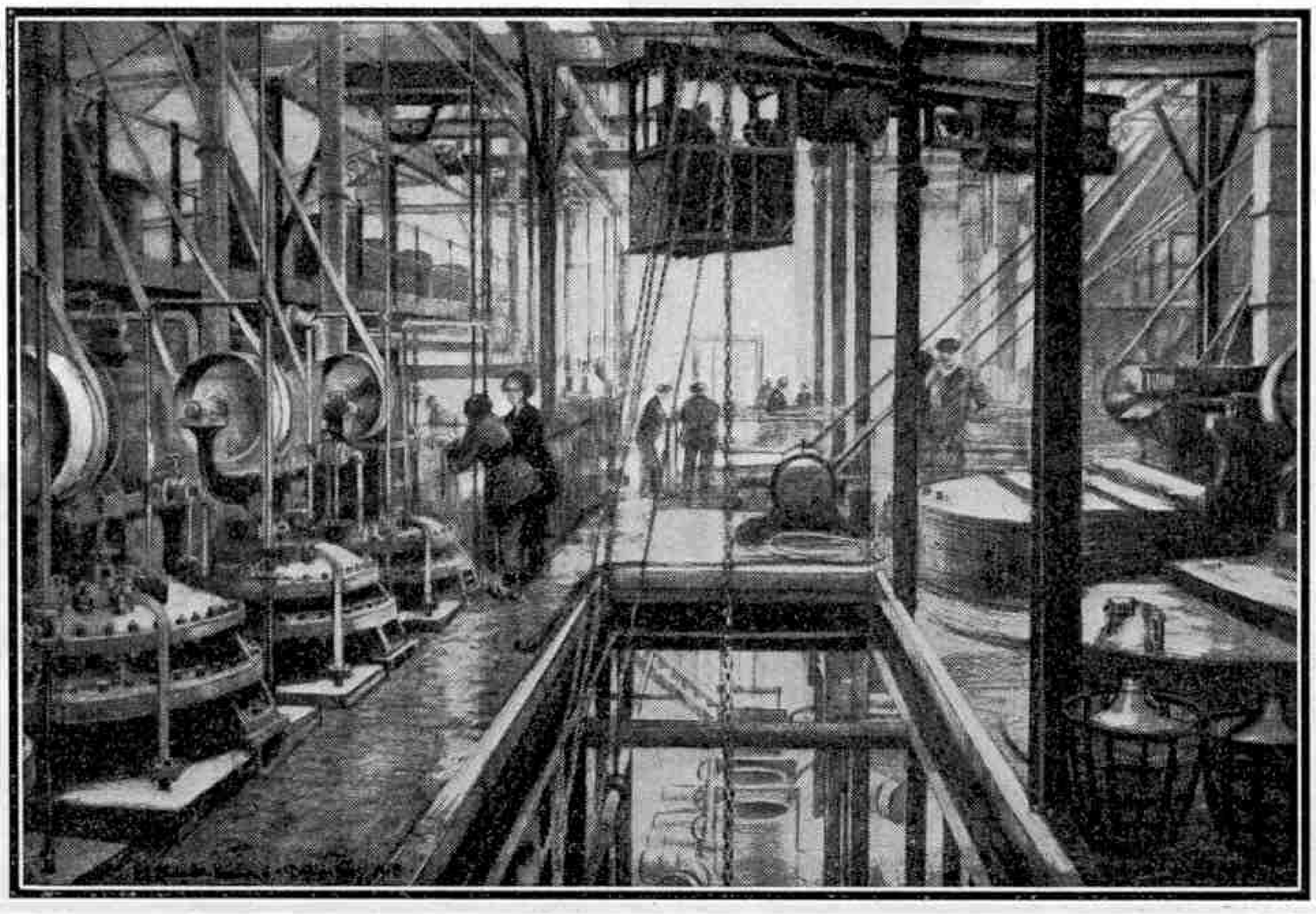
Mr. J. A. Reavell, M.I.Mech.E., M.I.Chem.E., began his career as a mechanical and electrical engineer. On completing his training he became manager of a large company concerned with the supply of evaporators for sugar refining and for use in other chemical industries. He became interested in the problems he encountered and at length decided to take up this branch of his profession. He has many inventions to his credit and the means that he has designed for the conduct of large scale chemical operations have a world-wide repute.

Mr. Reavell was one of the founders of the Institution of Chemical Engineers. He was elected President of the Institution in 1929, and is now serving a second year in this office.

raw material brought into the works in which they are employed and to check the progress of the changes carried out by continual tests, both of the final products and of those that are obtained at intermediate stages. This work calls for a considerable knowledge of chemistry and for the highest practical skill, and is of the greatest importance in ensuring efficiency and economy.

The members of the second class are concerned almost entirely with research work. It is they who by careful and laborious investigations into the properties of the materials peculiar to their special industries have made possible the great advances of recent years. They have been credited with the discovery of thousands of new compounds and with the introduction of improved methods of producing those already known. This is responsible work, but is not usually immediately productive.

Chemical changes that may be carried out with ease when small quantities of materials are employed may be found impossible when the beakers and test tubes of the research chemist are replaced by the much larger tanks and stills seen in works and factories, for the difficulty of thoroughly mixing ingredients and of controlling with sufficient exactitude the conditions under which they are brought together may defeat the best intentions of the chemist. The new conditions call for the services of the chemical engineer, and it is these men who form the third of the chief groups into which the industrial chemists may be divided.



A battery of autoclaves in a dyestuffs factory. These cast iron vessels are largely used in operations in which chemicals are heated under pressure.

They are not primarily concerned with discovery—as we have seen, that is the work of the research chemist—but are faced with the task of translating into large-scale practice the processes that their colleagues in the laboratory have worked out.

Naturally the members of this third group themselves must have had a thorough grounding in chemistry in order that they may be able to grasp the nature of the reactions that are to be carried out. But they must also be engineers, for upon them falls the onus of designing the plant employed. This is not such an easy task as may at first sight appear. From a purely engineering point of view the construction of a tank may seem simple, but when dealing with chemicals many unknown factors enter into the work. The men who design plant for use in the operations of industrial chemistry must not only possess an exact knowledge of power production and the principles of construction, but must have a profound knowledge of the physical and chemical properties of a very wide range of materials. In addition they must be prepared for effects of a kind unknown to the ordinary engineer, and which are not even revealed during preliminary research work on a small scale in laboratories. There such effects may be of no importance but when large operations are commenced may become so serious as to result in failure or even disaster.

It will be realised that the chemical engineer occupies a very responsible position and the preparation for good posts in this profession calls for a thorough training. The first necessity is a sound general education and this should be followed by scientific training of University standard. The usual practice is to regard chemical technology as a subject for post-graduate study, and the future chemical engineer therefore should first devote his energy to the task of obtaining a wide knowledge of the chemical and physical sciences that form the foundation of the industries in which later he will be engaged. By following this plan he makes certain that he becomes thoroughly familiar with general principles. In many respects this is even more important than actual detailed knowledge of any one branch of chemical industry, for without it he will have difficulty in facing new situations or in adapting himself to the changes in methods that result from the further discoveries that are being made continuously.

As a proof of the thoroughness of his acquaintance with scientific principles the intending chemical engineer should secure a degree in science, preferably an honours degree in chemistry, at a recognised University. This should be followed by a course in chemical technology. There are several institutions that arrange special post-graduate courses in this subject. Among these may be mentioned University College, London, where a special department has been founded for the study of the problems involved in the chemical industries, and the Imperial College, South Kensington, at which a department of Chemical Technology has been established. Both are well equipped for dealing with the problems that arise in conducting chemical operations on a manufacturing scale, practical work in the first of these being carried on in a laboratory of chemical engineering established as a memorial to Sir Wm. Ramsay, the famous chemist who discovered helium, argon and other rare gases in the atmosphere, while he was Professor of Chemistry at the College.

In addition to the two already mentioned, other Universities and Colleges have established departments of similar character. The courses arranged at these vary to a certain extent, and in some cases particular attention is given to industries associated with the locality in which the Institution is situated. But in all a systematic training is given in fundamental principles. The principles underlying manufacturing processes are dealt with, illustrations being freely drawn from practice, and opportunities are given to students to acquire a general knowledge of the design and construction of plant in which chemical operations are carried out on an industrial scale, and of the actual conduct of manufacturing processes.

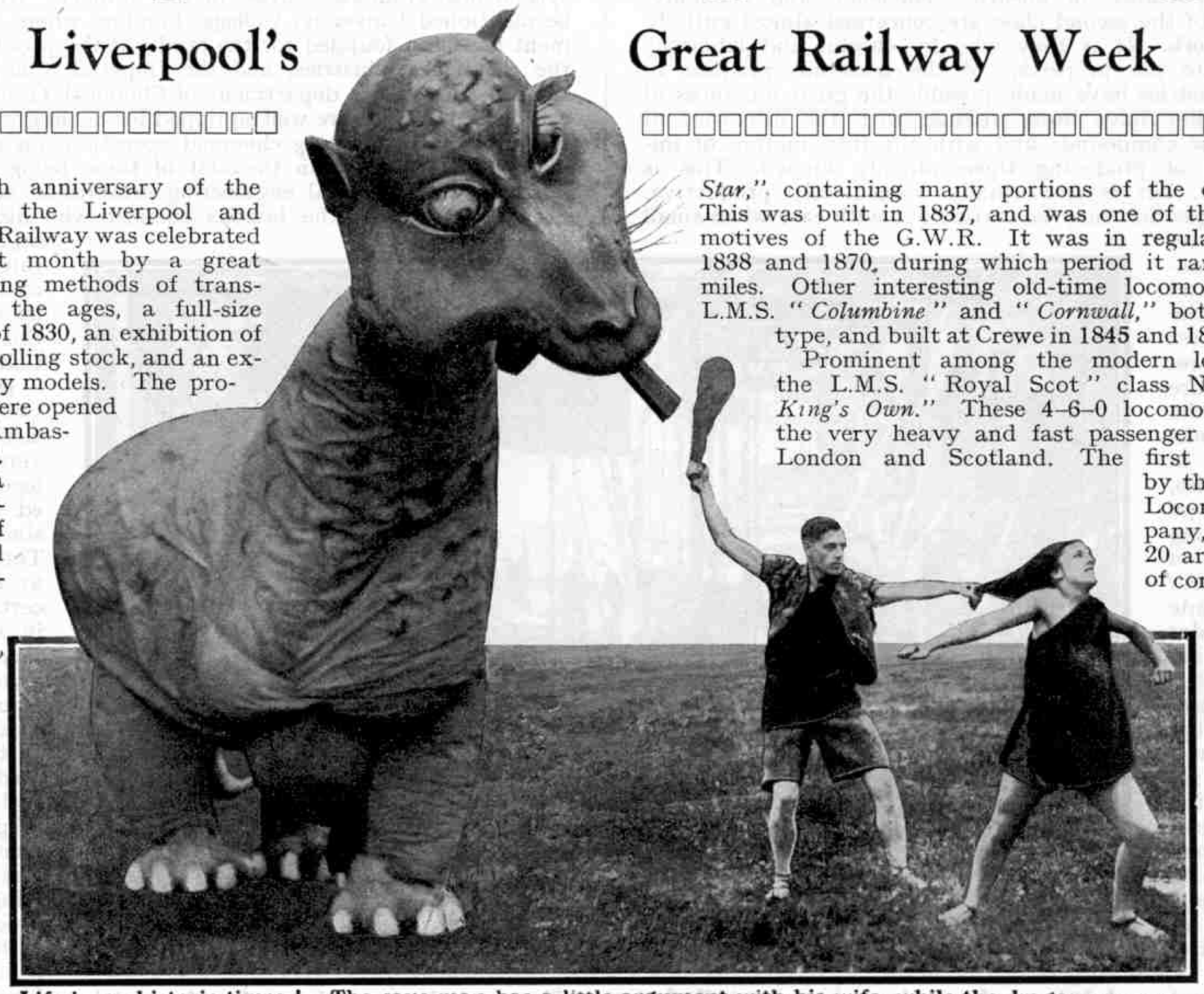
On the completion of the period of training the problem of finding an opening arises. No special apprenticeship schemes of definite character have been organised, as is done in certain other branches of engineering; but to a properly trained chemical engineer all chemical industries are open and at the present day a really competent man should have little difficulty in finding a suitable opportunity for commencing his career. A high salary cannot be expected during the first year or two, but with increasing experience the prospects improve rapidly, and once a responsible position has been reached an adequate salary will reward the long period of study and training that every successful chemical engineer must undergo. It is impossible to give any definite figures, but it may be said that the initial salary usually paid varies from £250 to £350 a year, and that after a few years' service this may be doubled or increased to £1,000 per annum. It must be pointed out that, as in all professions, the greatest rewards come to those who achieve the most responsible positions, and that the standing of a chemical engineer depends more on the ability he shows in conducting manufacturing operations and in controlling the workpeople of whom he is in charge, than on the success with which he has emerged from the training period.

The work of the chemical engineer is not necessarily confined to the factories in which the strictly chemical industries are carried on. He has a place to fill also in the manufacture of foodstuffs; for the study of the chemical changes involved is becoming increasingly important from the point of view of the purity and food value of these essentials. Nor are the prospects confined to the home industries. Abroad the work has enormous possibilities, and for the man of imagination who has a romantic tendency there is scope in many of the wilder parts of the earth. Such a man may turn to making wood extracts in the forests of South America or in the swamps of Borneo; if he is interested in the production of vegetable oils, including those that are used in the production of edible products as well as those employed (*Continued on page 759*)

Transport Through the Ages

Liverpool's Great Railway Week

THE hundredth anniversary of the opening of the Liverpool and Manchester Railway was celebrated in Liverpool last month by a great pageant illustrating methods of transport throughout the ages, a full-size replica of a train of 1830, an exhibition of locomotives and rolling stock, and an exhibition of railway models. The proceedings, which were opened by the American Ambassador, General C. G. Dawes, lasted a week and attracted thousands of people from all parts of the country and from abroad. The pageant and the exhibition of locomotives were held on the Wavertree Playground, 108 acres in extent, which adjoins the L.M.S. line from Liverpool to Crewe. A special line was laid down from the main line to the Playground, where sidings and a large circular track were constructed. The exhibition of models was held in St. George's Hall.



Life in prehistoric times! The cave man has a little argument with his wife, while the dragon appears to be wondering whether they are worth eating!

The circular track on the Playground was utilised for the running of trips by the replica of a train of 1830, with railway servants dressed in the costume of the period. The train was hauled by the veteran locomotive "*Lion*," built in 1838, and described in last month's "*M.M.*" This fine old locomotive is to be placed permanently on view at Liverpool Lime Street Station. The tickets issued to passengers on the train were replicas of the original tickets issued by the Liverpool and Manchester Railway.

On the sidings laid down on the ground was on view a unique collection of locomotives. Pride of place was given to a full-size model of Stephenson's "*Rocket*," built at the Crewe Works of the L.N.W.R. in 1911. A full description of this famous locomotive was given in last month's "*M.M.*," and it is only necessary to say that the splendid reproduction was examined with the keenest interest by thousands of visitors. It was noticeable that many people who passed from the "*Rocket*" to inspect the modern monsters returned for another look at the famous old locomotive. Close at hand was a reproduction of the "*North Star*," containing many portions of the original engine. This was built in 1837, and was one of the earliest locomotives of the G.W.R. It was in regular use between 1838 and 1870, during which period it ran some 430,000 miles. Other interesting old-time locomotives were the L.M.S. "*Columbine*" and "*Cornwall*," both of the 2–2–2 type, and built at Crewe in 1845 and 1847 respectively.

Prominent among the modern locomotives was the L.M.S. "Royal Scot" class No. 6161, "*The King's Own.*" These 4–6–0 locomotives deal with the very heavy and fast passenger traffic between London and Scotland. The first 50 were built by the North British Locomotive Company, and another 20 are now in course of construction at the L.M.S. Works at Derby. The L.N.E.R. exhibit was the much-discussed high-pressure compound engine "No. 10000." The unorthodox design of this locomotive made it very conspicuous, and it attracted a large amount of attention. Many of the visitors were obviously mystified by its appearance, and one spectator was heard to say that it was "too foreign looking" for his liking!



Slave driving in ancient Egypt. The overseer using his whip to stimulate a gang of slaves who are dragging a heavy block of building stone along on a crude wheeled carriage.

"*King Stephen*," No. 6029, the most recently-built member of the "King" class, was a worthy representative of the G.W.R. These locomotives, named after kings of England, still rank as the most powerful express passenger locomotives in the country. In spite of their power, however, they are singularly graceful in appearance, a fact that made a great impression upon the United States railway authorities when "*King George V*" visited the Baltimore and Ohio Railway centenary exhibition in 1927. Since then the Baltimore and Ohio Railway have built two locomotives incorporating several of the outward features of the G.W.R. locomotive. The Southern Railway sent the massive and dignified '*Lord Nelson*," No. E850, the first of the well-known "Lord Nelson" class 4–6–0, four-cylinder, express passenger locomotives.

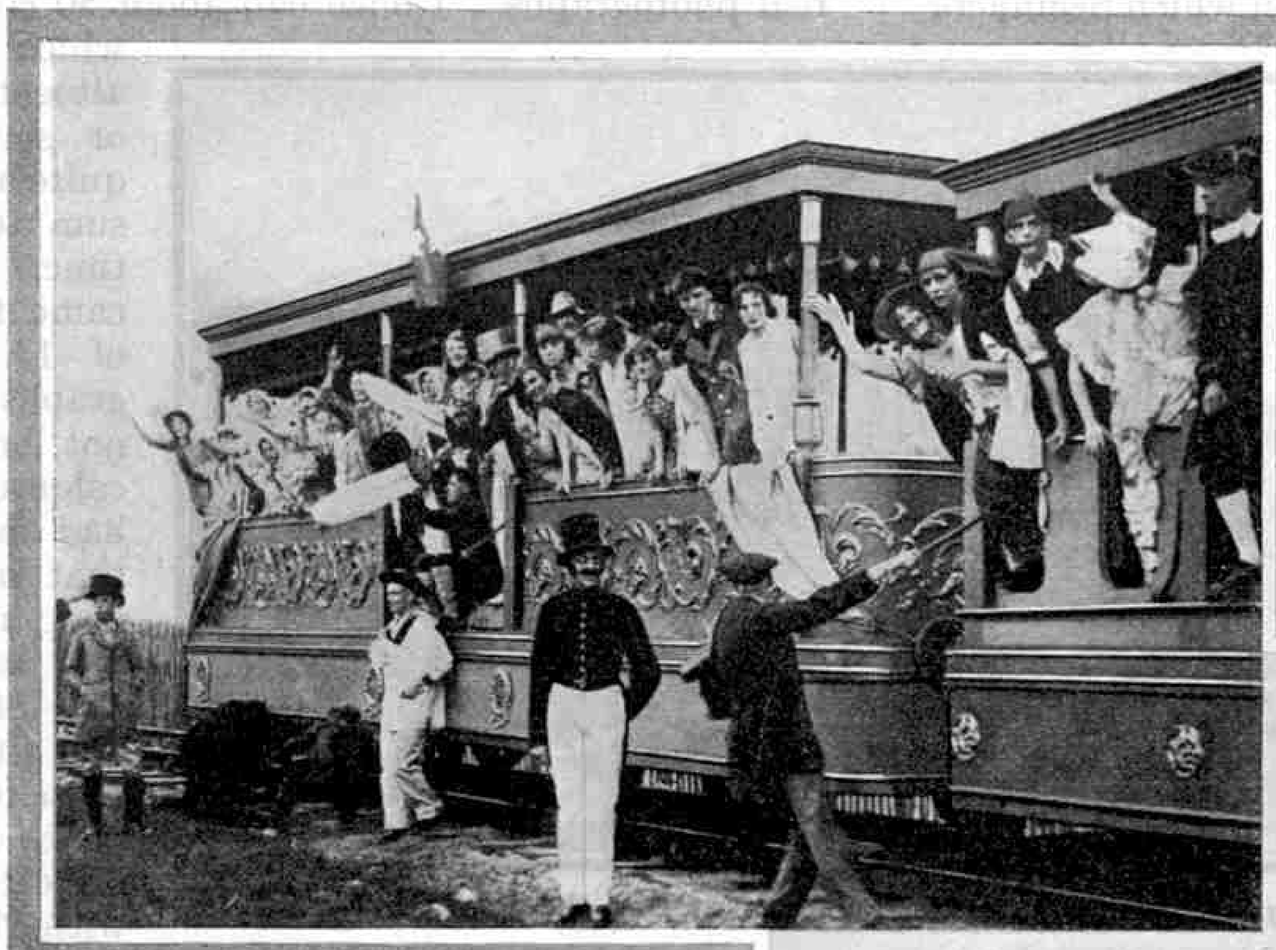
The L.M.S. "Beyer-Garratt" 2–6–0+0–6–2 articulated locomotive No. 4972, built by Beyer, Peacock & Co. Ltd., provided perhaps the most striking contrast to the "*Rocket*" and the "*North Star*." This is one of a group ordered by the L.M.S. for hauling the heaviest mineral trains without the necessity

of resorting to the practice of double heading.

A good deal of interest was taken in four locomotives built by British firms for use overseas. These included a 0–6–0 saddle tank for the Haifa Harbour Railway, Palestine, and a 2–6–2 tank for the Tanganyika Railway, South Africa, built by the Hunslet Engine Co. Ltd., Leeds; and a 4–6–0 tender engine for the Assam Railways, India, and a 2–6–2 tank for an Indian 2 ft. 6 in. gauge line, built by W. G. Bagnall Ltd., Stafford.

The exhibition of modern rolling stock was sufficiently varied and extensive to enable one to realise the enormous development that has taken place since 1830. In addition to first-class and third-class corridor cars, and dining, sleeping and kitchen cars, there were interesting wagons of various types developed for special purposes, such as the conveyance of coke, grain, and bananas. An L.M.S. 40-ton wagon that is unloaded at the sides in 30 seconds by a self-discharging device was inspected with interest.

The pageant of transport was a gigantic production, in which some 3,500 voluntary performers took part. According to a familiar slogan, the best age for Meccano is from 5 to 70; but the pageant producers went one better than this, for the youngest member of the cast was18 months old, and the oldest 79 years! The various episodes were performed on an enormous stage, 100 yds. in length, and the whole performance occupied more than two hours.



(Above) Pageant performers in replicas of the quaint carriages of 100 years ago—part of the train hauled by the "*Northumbrian.*" (Right) Dancers in the costumes of 1830 on the footplate of a replica of the "*Rocket.*"

Starting with the transport methods of prehistoric times, the 24 episodes depicted in the most realistic manner the gradual development of transport in all parts of the world. The earlier episodes were necessarily simple in type, but their very simplicity made them all the more impressive in their violent contrast with the present day. Gradually, as we passed down the ages, the scenes became more elaborate, culminating in picturesque brilliance in the Egyptian episodes, with their war chariots, and soldiers with flashing shields and helmets. The Greek and Roman episodes, and the Indian episode with its real elephants, also provided a brilliant spectacle.

Passing onward through the Middle Ages, illustrated by a scene introducing Don Quixote and his servant Sancho Panza, we were shown scenes of the American prairie in pre-railway days, with a realistic attack by Indians on an emigrant wagon. Next came two episodes illustrating vividly the discomforts and dangers of the stage coach era in England, and providing a striking instance of the enormous change that has been brought about in the short space of a century.

Finally the pageant led us to Lancashire and the dawn of the railway era. We saw how the coming of the railway was opposed tooth and nail by the great landowners and those financially interested in canals and roads; and how this opposition was overcome by the courage and determination of the railway pioneers. Finally there came the culminating episode, a splendid reproduction of the opening of the Liverpool and Manchester Railway. In this episode the various celebrities who took part in the historic event were represented, and the final incident, the departure of the Duke of Wellington's train hauled by the locomotive "*Northumbrian,*" driven by an excellent impersonator of George Stephenson, was splendidly done.

To railway enthusiasts the exhibition of models and miniature railways held in St. George's Hall was in some respects the most interesting feature of the celebrations. We have only space to mention a few more important items of this exhibition. Prominent among the models was one of the L.N.W.R. "*Lord of the Isles,*" by Mr. G. G. Poston of Moreton, Wirral. This splendid model, which is 4 ft. 6 in. in length, is an astonishingly perfect piece of work, and after inspecting it one was not surprised to learn that it had occupied its builder's spare time for more than 20 years! A "Dunalastair" type Caledonian engine by Mr. W. Ballantyne, of Annan, was another wonderfully perfect reproduction, representing 12 years' work. Another fine model that must be mentioned is one of a North British "Atlantic," built by Mr. W. T. Hardwick, of Sheffield, and measuring 5 ft. 5 in. in length. The largest model in the collection was that of an articulated locomotive of the Aitchison, Topeka and Santa Fé Railway, which measured 6 ft. 8 in.

The historic models were of great interest. Among them was a model of one of Richard Trevithick's original locomotives, and in looking at this one felt that in these centenary celebrations there was a danger of the pioneer work of the Cornish inventor being passed over. Trevithick was undoubtedly the "father" of the railway locomotive, and the wonderful achievements of George Stephenson were based upon the pioneer work of Trevithick, followed by that of Hackworth, Hedley, Murray and others. A model of one of Murray's Leeds locomotives was on view, and also one of Hedley's "*Wylam Dilly.*"

Interesting as were these models, they could not compete for sheer fascination with the electrically-operated model railway constructed by Mr. J. H. Woolley of Sheffield. This consists of four main lines with sidings, the total length of track being no less than 600 ft., and visitors watched with keenest interest as Mr. Woolley manipulated the controls that stopped and started his wonderful models of famous locomotives of all ages. A procession of these, headed by a reproduction of the "*Rocket,*" was remarkably impressive. The miniature of this locomotive, which is believed to be the smallest working model of the Stephensons' famous engine in existence, was followed by equally remarkable models that included scale reproductions of G.N. and Midland "Singles," the famous L.N.W.R. locomotive "*Cornwall,*" a Midland Compound, No. 1121, and many other engines, a reproduction of an engine of the "Royal Scot" class bringing up the rear.

Mr. Woolley's layout is so extensive that on it four model trains may be run at the same time. The first to be sent off on its journey round the track was an excellent representation of the "*Flying Scotsman*" at the head of which was a model of the "Super-Pacific" locomotive No. 2753, "*Harvester.*" This was followed by miniatures of the "*Torquay Pullman,*" hauled by a locomotive of the "King" class; a model of the "*Royal Scot,*" with a reproduction of "*Sir Gilbert Claughton*" in charge; and finally a goods train hauled by an L.N.W.R. "Prince of Wales" class engine.

Collecting Railway Photographs

A Few Hints on an Interesting Hobby

By C. R. Woodward

THE keen interest in railways that has been aroused by the formation of the Hornby Railway Company has led large numbers of boys to take up as a hobby the collecting of railway photographs. In many respects this is a comparatively easy hobby to commence, but there are a few points on which beginners are uncertain as to the best plan to adopt. This article has been prepared with a view to helping such boys, and it is written from the point of view of an average "*M.M.*" reader.

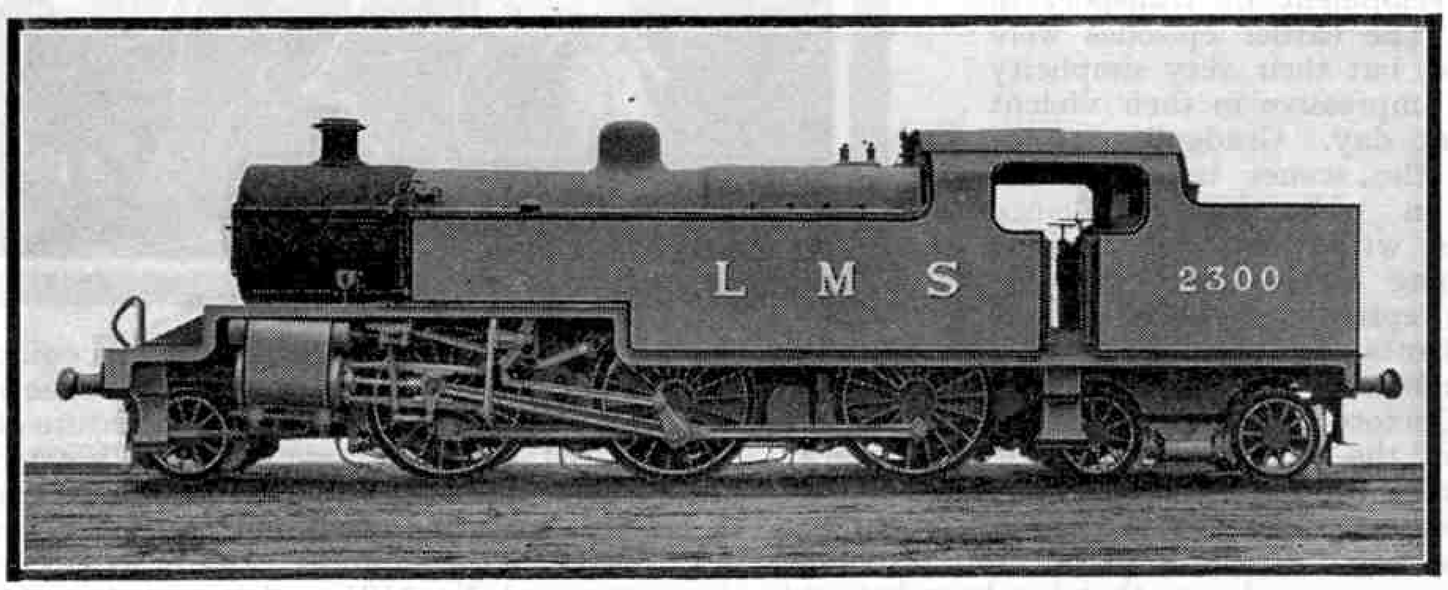
Although I have only reached the modest age of 16 I have collected railway photographs for some time and have gathered together quite a large number. Formerly my collection was a very miscellaneous one in regard to the size of the photographs, but I have now weeded out all but those of post-card size. This size is undoubtedly the best for all practical purposes. Smaller photographs generally fail to show detail sufficiently, and they are often extremely aggravating because the very thing one wants to see clearly is shown on such a small scale as to be useless. On the other hand, large photographs are effective and if they are good ones they show up detail splendidly; but they are difficult to store safely and conveniently, and are very awkward to carry about to show at a meeting of a H.R.C. Branch or elsewhere. Another drawback to large photographs is that they are not easy to obtain in sufficient numbers without the expenditure of a good deal of money. Post-card size photographs exist in great variety and are fairly easily obtainable.



"*Railway Photographs,*" Liverpool, camera man at work on the South Wales Express.

Now I want to give a serious warning to all readers who propose to commence collecting, and that is not to collect any but real photographs. Once you have real photographs in your collection you will not want any other kind, and you will soon come to dislike the inferior coloured cards that previously you might have admired. It is a curious thing that even the best coloured cards show up very badly alongside real photographs. I once had about 50 coloured cards, which cost me altogether some six or seven shillings, quite a considerable sum to me at the time. Then I became the possessor of 14 real photographs and it was not long before the coloured ones simply had to go. I felt that my collection was not uniform and was spoiled by the inferior cards; and although I sold these for only a few pence I have never regretted parting with them.

It is unfortunately a fact that real photographs are not so easy to obtain as the coloured cards. The latter can be had from almost any stationer, but comparatively few shops seem to find that the demand for real photographs justifies keeping them in stock. To readers who find any difficulty in this direction I can confidently recommend the post-card photographs published by Messrs. Railway Photographs, 23, Hanover Street, Liverpool. This firm's photographs are mostly from originals by a railway photographer who is well known to all "*M.M.*" readers—Mr. F. E. Mackay. A complete list of subjects and a specimen card will be forwarded to any "*M.M.*" reader who sends fourpence to the address just given. I myself have the full series of these cards and cannot praise their qualities too highly. They have the very unusual merit of being at the same time cheap and good.



Courtesy] [*Railway Photographs, Liverpool*

The first of a series of L.M.S. 2-6-4T locomotives introduced in 1927 for heavy suburban passenger traffic.

In making a collection of railway post-cards some definite system should be followed from the commencement. If the cards are left lying about loose they

quickly get dirty and damaged at the corners; and before long they look so disreputable that all interest in them is lost. However small the collection may be at first, it should be stored in such a manner that all the cards are well protected, while at the same time each one is readily available when required.

I started with a post-card album of the ordinary type, but after many unsuccessful attempts to classify my cards satisfactorily I abandoned this scheme and transferred my collection to a case. The main defect of an album is the impossibility of keeping a growing collection systematically arranged. For instance, among my earliest cards was a "Royal Scot." Three months later I got a card of another locomotive of the same type, but I could not put this in its proper place beside the first one because, in the interval, the way had been blocked by the insertion of many engines of quite different types. In order to bring the two "Royal Scots" together I should have been obliged to move every card in the collection—beyond the first one of the "Royal Scot"—one space forward. This would have happened each time a second card of a particular type was obtained, and of course it was a hopeless state of affairs.

The great advantage of a case, or better still a drop front wooden cabinet such as that supplied by Messrs. Railway Photographs, is that, as the classification is done by means of guide cards, the collection may be expanded to any size without upsetting the arrangement. A small collection looks rather lost in a cabinet, but it will soon grow; and if you start your collection in this manner you will be very glad later that you did not waste your time and money on albums.

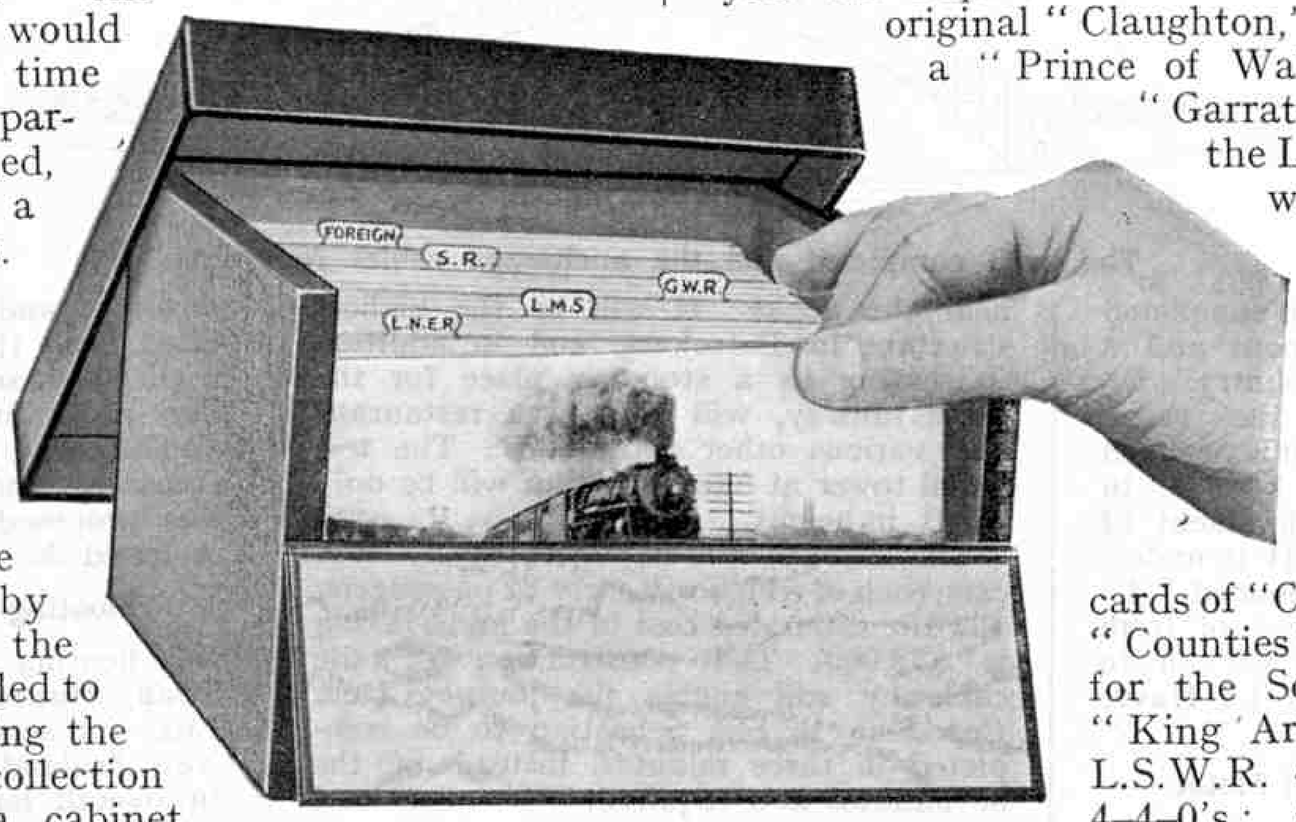
The classification of cards may be done in many different ways, and the method adopted is usually a matter of taste. If the collector is specially interested in some particular feature of locomotives he will probably make his classification from this point of view; but if his interest is general the best plan is to group the locomotives in the various classes into which they naturally fall. My own method is quite simple. Most of my L.M.S. photos are all L.N.W.R. section locomotives and therefore they are divided into "Royal Scots," re-boilered "Claughtons," original "Claughtons," etc. On the other hand I have photographs of many sections of the L.N.E.R., so apart from "Pacifics," "Shires," and "Atlantics," I classify them into G.E. section, G.C. section, G.N. section, etc. As my collection grows, however, these sections will be sub-divided into locomotive classes, such as "Lord Farringdon," "Sir Sam Fay," and "Director" classes on the G.C. section. I may mention, by the way, that my collection now numbers just over 200 real photographs of which all but about 30 are British, the remainder being photographs of American locomotives and trains.



Photo] [*Railway Photographs, Liverpool*

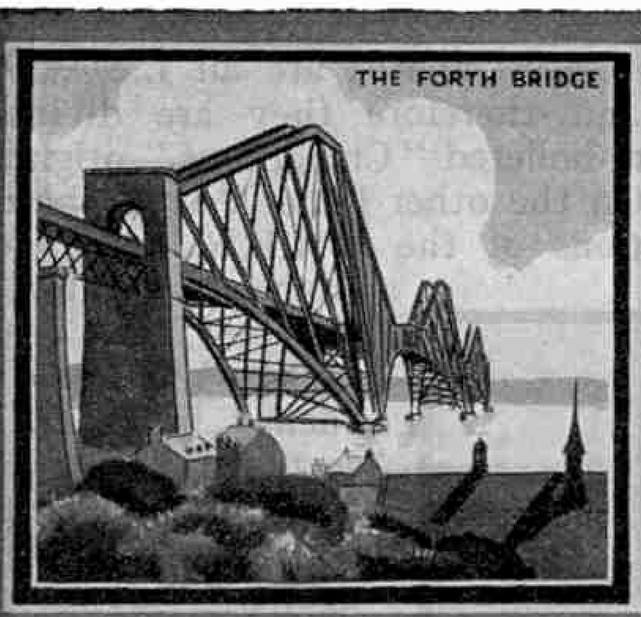
The "*Flying Scotsman*" Express hauled by No. 4472, the famous "*Flying Scotsman.*"

Now for some ideas on what cards to collect. First of all you will want at least two photographs of each of the four monster types of the British groups—the "Royal Scot" (L.M.S.); "Pacifics" and super "Pacific" (L.N.E.R.); "King" (G.W.R.); and "Lord Nelson" (S.R.). Other L.M.S. types that you will require are a re-built "Claughton" and an original "Claughton," a "Midland Compound," a "Prince of Wales," a new 2–6–0 and a "Garratt" (2–6–0+0–6–2). On the L.N.E.R. the first types you will want are G.C. 4–6–0's, and "Directors," G.E. 4–6–0's, and N.E. "Pacifics"; not forgetting the enormous "Garratt" and the booster-fitted 2–8–2 locomotive. In your G.W.R. you will need cards of "Castles," "Stars," "Saints," "Counties" and "Cities"; while for the Southern you will require "King Arthurs," L.B.S.C. 4–4–2's, L.S.W.R. 4–6–0's, and S.E. and C. 4–4–0's; and you should have also a photograph of "*Remembrance*" (4–6–4T), and the big 4–8–0 shunting tank. These are only a few of the types of which you must have photographs in order to make your collection at all representative. They form a good basis, however, and the remainder will come in time.



Special filing cabinet for storing post-card-size photographs.

Whenever possible photographs of locomotives should show them in steam and attached to trains. A locomotive in an official photograph standing by itself and not in steam looks very lifeless. Such photographs of course have the great merit of showing the utmost possible amount of detail, and it would (*Continued on page 808*)



ENGINEERING NEWS

International Rivalry in Shipbuilding

In recent issues of the "*M.M.*" brief details have been given of giant ships planned or now being built in various countries in endeavours to capture a greater share of the passenger traffic across the Atlantic Ocean. Two of these vessels—the German liners, "*Europa*" and "*Bremen*"—have in fact, already been completed. Others include an Italian vessel and, of course, the ships for the two British Companies, one for the White Star Line and two for the Cunard Steamship Company, the last-named having definitely decided to construct a sister vessel to the 70,000 ton liner that is to be built on the Clyde. America also is concerned in this international rivalry. In the United States preliminary investigations of problems connected with the construction of two liners larger than any now in existence are in progress and a special committee has been formed to decide whether the Government will be well advised to advance a sum of £9,000,000 for the purpose of building them.

It is now learned that France also is to enter the struggle for supremacy on the ocean. Negotiations in regard to a new liner have been completed between the French Government and a shipping company in that country. No definite information about the vessel to be built is yet available, but it is reported that it will measure about 1,000 ft. in length and will have a displacement of from 65,000 to 70,000 tons. It is understood that the vessel will be named "*La Paix.*" It will possess a speed of from 28 to 30 knots and will thus be able to complete the voyage between Le Havre and New York in five days.

World's Largest Fly-Wheel Motor Generator Set

A flywheel motor generator set that is claimed to be larger than any previously erected is now being built by the Westinghouse Electric and Manufacturing Company. The set includes three 3,500 k.w., 700 volt d.c. generators, and these are coupled to a 6,500 h.p., 25-cycle induction motor fitted with a 15-ft. diameter fly-wheel. The total weight of the set is 267 tons, the fly-wheel alone weighing 73 tons. The set has an overall length of 60 ft. and has a continuous rating of 10,500 k w., which is equivalent to 14,000 h.p.

Aerial Cable Railway for Barcelona

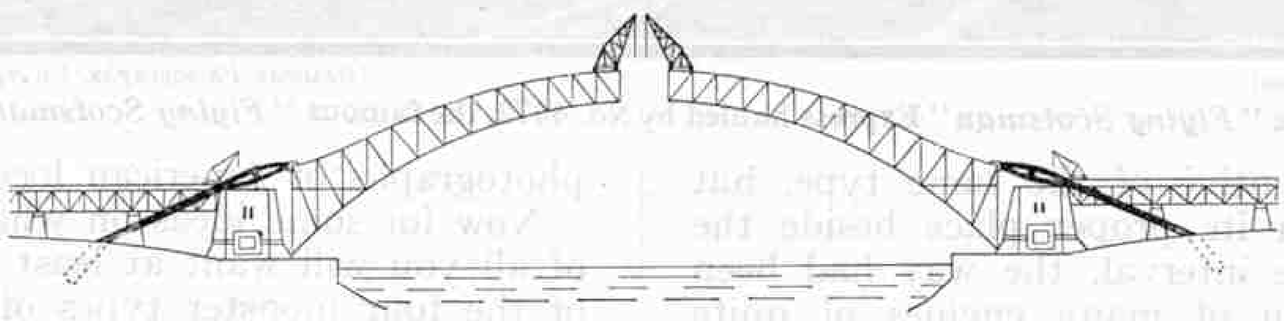
An aerial cable railway is now being constructed across the Port of Barcelona. This will be one mile in length and will cross the Port at a height of 200 ft. in order not to interfere with the shipping. Its purpose will be to carry passengers from Barcelona to San Sebastian, a neighbouring pleasure beach.

The starting point of the railway is the Montjuich mountain, which overlooks the city. There will be a second stage in Barcelona itself. this being a huge tower, 360 ft. in height, that is to be constructed near the docks. It will be the highest structure in Barcelona, and in addition to serving as a stopping place for the cable railway, will contain a restaurant and various other attractions. The terminal tower at San Sebastian will be only 260 ft. in height.

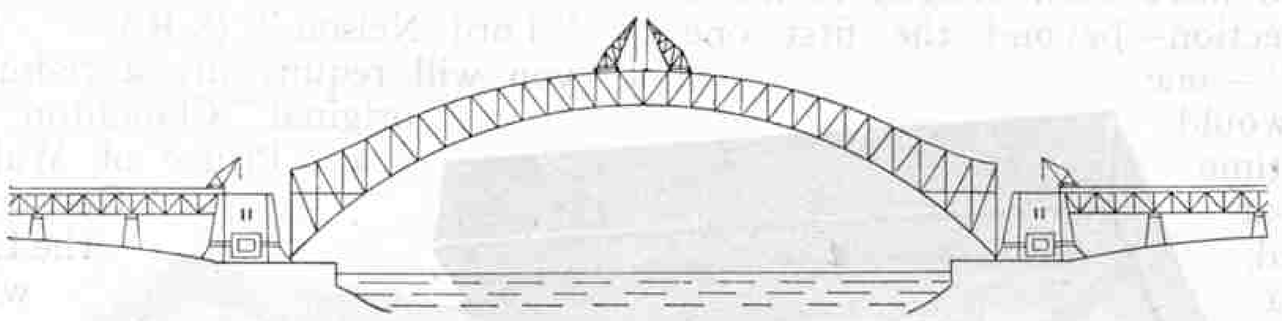
The service will be operated by four cars, each of which will carry 22 passengers, and the estimated cost of the undertaking is £75,000. The construction of the cableway will enable the journey from Barcelona to San Sebastian to be completed in three minutes, instead of the 30 minutes now required.

World's Largest Coal-Handling Plant

A huge coal-handling plant is now being made at Manchester for the Gas, Light and Coke Co. Ltd., London. The plant will be large enough to deal with the coke produced from 1,200 tons of coal per day, and will be the largest of its kind in the world. It will be fully equipped with screening and loading plant, wagon tippers and automatic weighing and recording machines, and there will be over 1,000 tons of steel in the structure, which will take at least a year to construct.



Final stages in the building of an arch bridge. Erecting the centre panels, between which a narrow gap is left.



The arch completed and the anchorage cables removed.

Canadian Ship Canal

An interesting scheme for the construction of a canal to connect the Bay of Fundy with the Gulf of St. Lawrence is now receiving the attention of a special Commission appointed by the Canadian Government. If the proposal is approved, the canal will be cut across the Isthmus of Chignecto, which connects Nova Scotia to the mainland. The construction of the canal would greatly reduce the navigation distance from Montreal and Quebec to St. John, New Brunswick, and to Boston, New York and other Atlantic ports of the United States.

The route marked out for the projected canal is about 15 miles in length and runs from Cumberland Basin in the Bay of Fundy to Bay Verte on the southern shore of the Gulf of St. Lawrence. The construction of a canal of this length will be an interesting engineering task, for it will be necessary to make the waterway sufficiently wide and deep to allow the passage of large ocean-going vessels.

It is interesting to know that 40 years ago the construction of a ship railway across the Chignecto Isthmus was begun. On this locomotives were to haul the vessels making the crossing and these would have been lifted from the water and returned to it when necessary by means of giant cranes. The possibility of constructing a canal also has been under consideration on many occasions, and a scheme for this purpose was proposed as long ago as 1823 and reviewed on several occasions.

Floating Dock for New Zealand

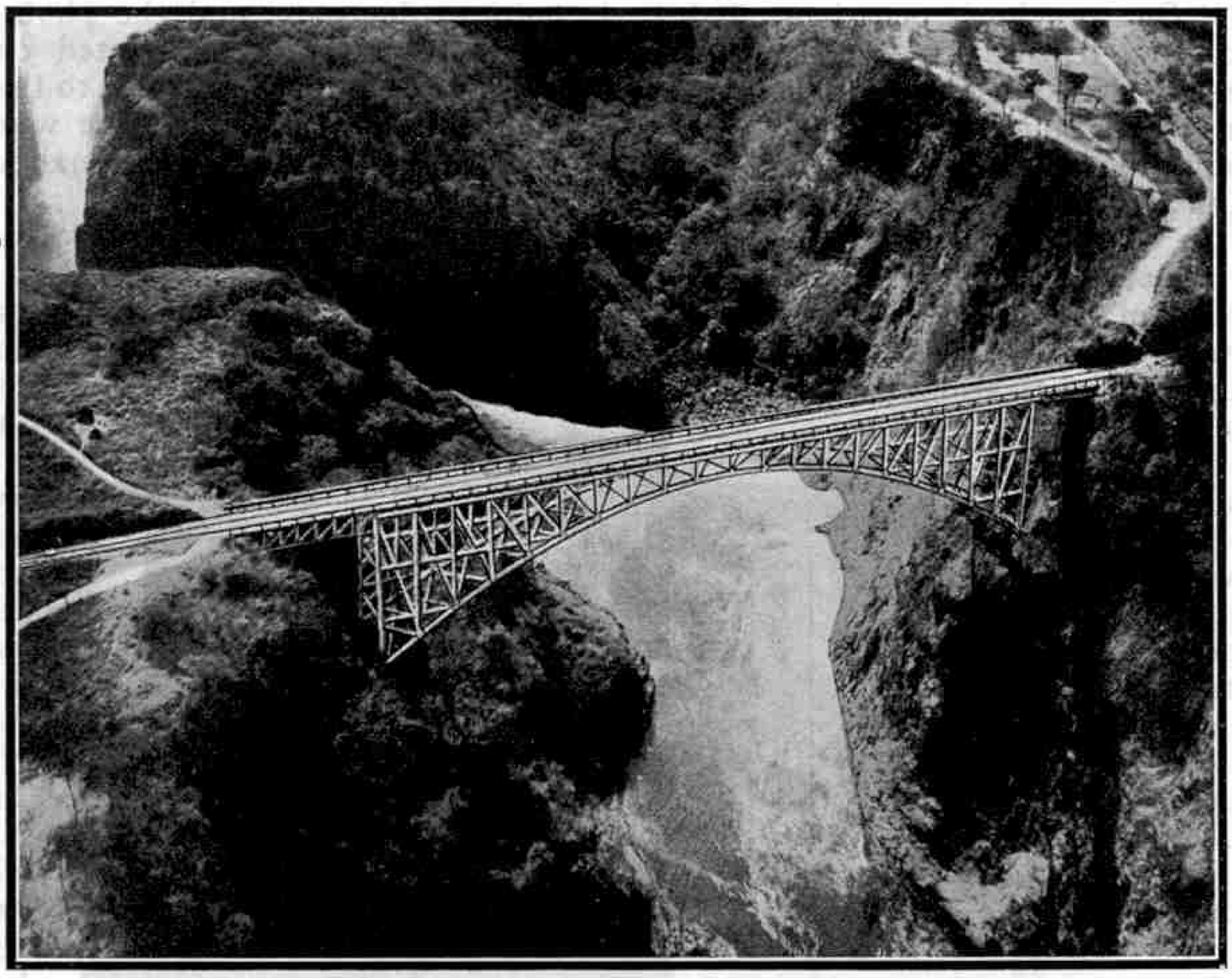
A floating dock is now being built by Swan, Hunter and Wigham Richardson Ltd., for service at Wellington Harbour, New Zealand. The dock is to be 504 ft. in overall length, and 117 ft. in overall width, and it will have a clear width of 88 ft. The work of construction is expected to occupy about a year, and when the dock is completed it will be towed to its destination—a distance of over 12,850 miles. This will be a record journey for a floating dock, and will exceed by 4,350 miles the journey made by the famous dock at Singapore. It is interesting to note that this also was built by Swan, Hunter and Wigham Richardson Ltd., who have constructed no fewer than 30 large floating docks that are now in service in various parts of the world.

Reconstruction of Zambesi Bridge

The reconstruction of the bridge across the Zambesi River at Victoria Falls, Rhodesia, has now been completed. As stated in the issue of the *"M.M."* for March 1929, the work was carried out by the Cleveland Bridge and Engineering Co. Ltd. of Darlington. It involves strengthening the bridge and widening it in order to accommodate the roadway and a footpath in addition to a double railway track, and while operations were in progress railway traffic was only interrupted for certain short specified periods. The task of rebuilding the bridge under these conditions was not easy, for in addition to strengthening it considerably it was necessary to remove the whole of the former deck.

The first step in replacing the railway bridge by one suitable for traffic of all kinds was to raise the permanent way to a height of 4 ft. 7 in. above its original level. The old deck was then dismantled in sections 25 ft. in length, this portion of the work occupying a period of four months. The structural work involved in increasing the width of the bridge from 33 ft. to 43 ft. was then undertaken, this involving also the constructional work necessary to give the bridge the necessary strength to carry the extra weight.

It will be remembered that the bridge spans the gorge of the Zambesi River at a point 700 ft. below the Victoria Falls. There the gorge is 400 ft. in height and about 650 ft. in width at the level of the bridge. The Falls are visited by large numbers of tourists, and those who travel by road will now be able to cross the bridge immediately instead of having to load their cars on railway wagons, thus effecting considerable saving in time.



An aerial view of the Zambesi Bridge before the reconstruction described on this page.

Immense Hydro-Electric Undertaking in Bolivia

An interesting hydro-electric scheme now receiving the attention of the Bolivian Government provides for the harnessing of the Rio Desaguadero, the outlet of Lake Titicaca. It is proposed that this river should be diverted to a new course that would provide a fall of about 12,050 ft. in the comparatively short distance between Lake Titicaca and the ocean. In order to put the scheme into force, it would be necessary to construct a tunnel through the Cordilleras. This tunnel would be 15½ miles in length and would cost approximately £50,000,000. The benefits to be derived from the scheme, however, should make it a comparatively simple matter to raise this money from neighbouring countries.

It is interesting to note that the scheme would not only provide electricity, but also would make possible the irrigation of thousands of square miles of land that at present is unproductive.

Harbour Bridge for Port of Halifax

An interesting bridge is to be constructed across the harbour at Halifax, Nova Scotia, thus connecting the city with Dartmouth on the northern shore of the waterway. The rival merits of the suspension and cantilever types of structure are now being discussed. The estimates that have been prepared show that a suspension bridge could be built for about £481,500, while one of the cantilever type at the same location would cost about £509,500.

When completed the bridge will avoid the necessity of transporting passengers and freight by ferry and will greatly improve communication between Halifax and a great part of north-eastern Nova Scotia.

Large Electric Air-Compressors

Two air-compressors, that probably are the largest of their kind in the world, are being constructed by a German firm to the order of the Victoria Falls Power Company. Each of the compressors will be able to deal with 43,000 c. ft. of free air in one minute, and will raise it from a pressure of 12.1 lb. to 117.1 lb. per sq. in. absolute. The compressors will be operated by electric motors, working at 10,500 volts, that develop 9,000 h.p.

Building Moved En Bloc

An interesting feat of engineering was carried out recently at Pittsburg, when a large granite building was moved en bloc a distance of about 300 ft. The building had a total weight of about 6,000 tons, and measured 110 ft. in length by 75 ft. in breadth. A feature that greatly added to the difficulty of the work of moving it was that a turn of 90 degrees had to be made during the move. To facilitate the operation it was found necessary to cut the granite at certain points, and oxy-acetylene blow-pipes were of great assistance in this part of the work.

Harbour Improvements at Trinidad

A scheme of harbour development at Port of Spain, the capital of the British West Indies, is now receiving attention. Port of Spain is at the north end of the island of Trinidad and is near the mouth of the Orinoco River. This great stream brings down a large quantity of silt from the mainland of South America, and the deposition of this in the sea has made approach to the Port impossible for large vessels. These are compelled to remain at a distance of three miles from shore and it is necessary to transfer passengers and cargo to and from the Port by means of small lighters. The operation can only be carried out in calm weather. It is a great inconvenience and adds appreciably to the cost of many commodities landed on the island.

At present two schemes for the development of the Port are under review. The first provides for the dredging of a channel from the present moorings to a point much nearer the shore. The channel would be 35 ft. in depth, which would be sufficiently deep to enable the largest vessels now calling to reach the quay wall that would be built under this scheme, and it is estimated that the total cost would be £304,000.

The silt removed during dredging operations would be dumped on the landward side of the quay wall. In this manner an area of about 100 acres could be reclaimed, and on this offices and warehouses could be constructed.

The second of the two schemes involves the construction of a long steel pier, at the end of which vessels would be moored in order to discharge passengers and cargo. The great drawback to this plan is that the pier would have to be at least three miles in length.

In order to off-set any unemployment that would be caused among lightermen it is proposed to make use of the new quay or pier optional until the men can find other work.

Water Power Sites in British Columbia

Investigations in British Columbia have revealed the existence of undeveloped water power sites along the coast of that province north of Vancouver. A scheme for developing 1,200,000 h.p. by utilising the waters of Lake Chilco has already been suggested, and preliminary reports now indicate two other sources bringing the possible power development in the coast district up to a total of 3,000,000 h.p.

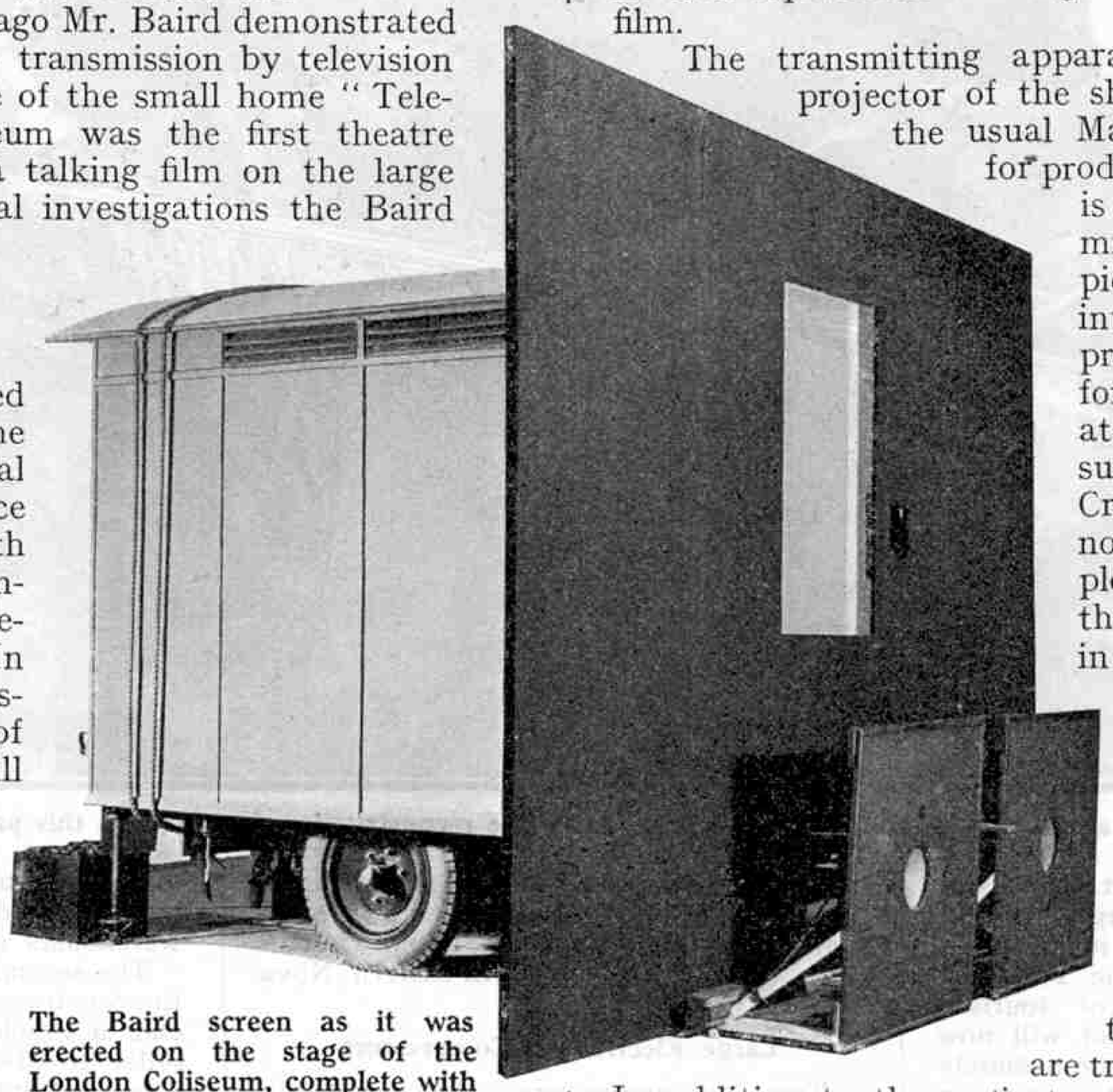
These two new sites are at Tahtsa Lake and Eutsuk Lake. By turning the waters of these lakes westward to the sea, instead of allowing them to follow their present course eastward into the Fraser River, and erecting the necessary hydro-electric plant, engineers believe that power to the extent of 1,800,000 h.p. can be harnessed.

First Public "Tele-Talkie" Demonstration

Another Step in Baird Television

THE first public "tele-talkie" demonstration took place on 9th August, 1930, at the London Coliseum, and it marked another milestone in the progress of Baird television. On previous occasions Baird screen television had been featured as a part of the variety performance at the Coliseum, but on this occasion, in addition to the normal television transmission, a talking film was transmitted.

Some twelve months ago Mr. Baird demonstrated at his laboratories the transmission by television of a talking film on one of the small home "Televisors," but the Coliseum was the first theatre in the world to show a talking film on the large screen. In their original investigations the Baird Company found that the transmission of cinematograph films, although it was simpler than television, provided little attraction; but the tele-talkie has a special interest. The importance of sending speech with vision is increasing considerably where tele-talkies are concerned. In normal broadcast transmission the restriction of a narrow wave band still operates, thus restricting the scenes transmitted to one or two persons. Such subjects when seen only—that is without their accompanying sound—are of small interest compared with the combination of sound and vision as shown by the tele-talkie. The sound helps the vision and the vision helps the sound; and the combination is infinitely superior to one or the other separately.



The Baird screen as it was erected on the stage of the London Coliseum, complete with loud speaker equipment.

Some of the problems of normal television transmission are simplified in the case of the tele-talkies. For example, the problem of securing sufficient light to actuate a photo-electric cell is almost non-existent, although it was this problem that, in the earlier days of television, formed one of the chief barriers to success. The technical side is reasonably simple in its operation. The talking film employed has on one edge a ladder-like band of light and shadow. This is a representation or photograph of the sound accompanying the image, and it is seen quite clearly in one of the accompanying photographs showing the first tele-talkie film used by Mr. Baird in his laboratories.

This sound is reproduced by projecting, through the band of varying strips of light and shadow, a narrow beam of light that falls upon a photo-electric cell. The arrangement used for this purpose is illustrated in Fig. 1, in which the light source, condenser, lenses, etc., are shown in a simple manner. As the film moves forward the varying densities cause the light to fluctuate, and the photo-electric cell responds by sending out a modulated current. This current, greatly amplified, is supplied to the loud speaker through the medium of either wire or wireless, and the speaker in turn reproduces the original sound recorded on the film.

The transmitting apparatus consists of a film projector of the shutterless type, in which the usual Maltese Cross arrangement for producing intermittent motion is replaced by a revolving mirror drum, so that the picture projection is never interrupted. This type of projector was very popular for cinematograph work at one time, but it has been superseded by the Maltese Cross apparatus that is now almost universally employed, owing mainly to the loss of light involved in the mirror apparatus. The shutterless type of projector is ideal for television purposes, however, as the image can be transmitted in an exactly similar manner to the ordinary television image.

The means by which the pictures on the film are transmitted are interesting. In addition to the projector itself, certain lenses, etc., are required, and these are shown diagrammatically in Fig. 2. When the rays of light have passed through the condenser they meet the film as it passes through its own "gate" or guide, and an image of the film is projected on to what is called a scanning disc. The operation of this disc was fully described in the issues of the "*M.M.*" for July and August 1929, but we may remind readers that its purpose is to enable the photo-electric cell, or "electric eye," to "look" at the image to be televised in instalments. If this were not done a very large number of photo-electric cells would be required, but the use of the disc enables a single cell to do the work.

The disc that accomplishes this consists of a circular sheet of metal, cardboard or other suitable material, near the edge of which a spiral series of holes is punched. The holes are spaced around the disc at equal intervals, and they are staggered by placing them on successive concentric circles. When such a disc is rotated in front of an image every portion of the latter is seen in turn, the effect being to break up the light from it

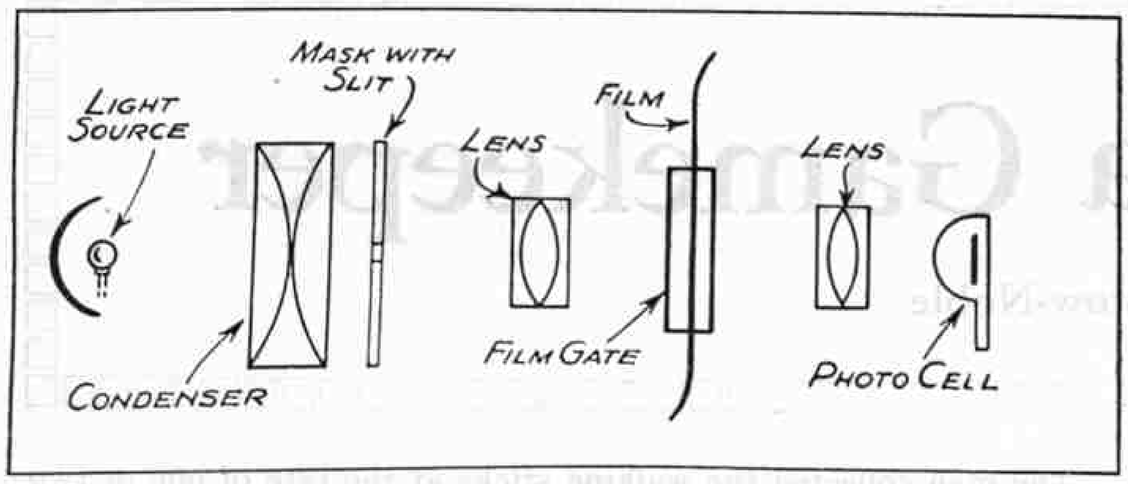


Fig. 1 showing how the sound effects on the film are handled by the photo-electric cell.

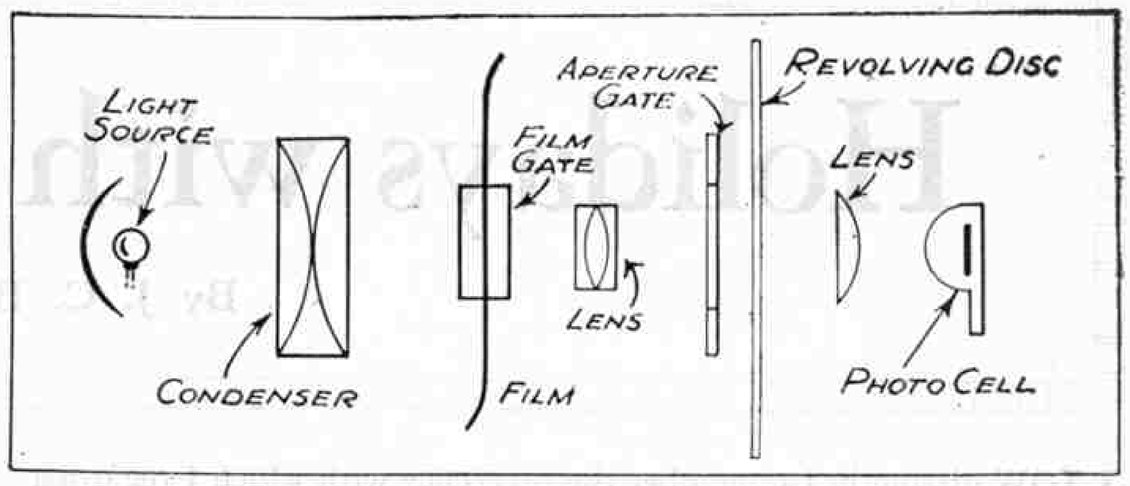


Fig. 2 showing how, with the aid of the lens, an image of the film is projected on to the scanning disc.

into a series of fragments. Exactly similar discs are included in both the transmitting and the receiving apparatus, and these are run at equal speeds in order that the second may piece together in their correct positions the fragments into which the first breaks up the image sent out.

When " televising " a film by means of the apparatus shown in Fig. 2 the image is flickerless —that is it possesses uninterrupted movement; and by means of the lens it is focussed on the disc, as shown by the shaded rectangle in Fig. 3. As the disc rotates the entire image is covered once during each revolution, and it is scanned in successive small areas. At any one instant when an aperture is passing over the picture it will allow a certain amount of light to pass through, according to the area scanned. This is made to influence the photo-electric cell in the usual manner, an additional lens being brought into operation to ensure that the light passing through the disc is spread over the active area of the cell. From this point the television transmission is normal.



Portion of the first tele-talkie to be publicly demonstrated. Note how the sound record runs down a track by the side of the picture record.

One of the accompanying photographs shows the caravan trailer that was employed for housing the Baird apparatus on the revolving stage of the Coliseum. The screen, made up from the bank of lamps, is positioned on the black background, and the loud speaker equipment is shown below.

As we have pointed out, the " tele-talkie " demonstration was carried on in conjunction with a normal television transmission. The speakers and artists carried out their share of the performance from a special studio at the headquarters of the Baird Television Co. at Long Acre. This room, together with the adjoining control room, will later replace the studios from which television broadcasts are now being transmitted, and it is interesting to know that for the first time in this country the projection light was raised and lowered by means of a special tilting head in order to adjust it to the heights of the persons being televised.

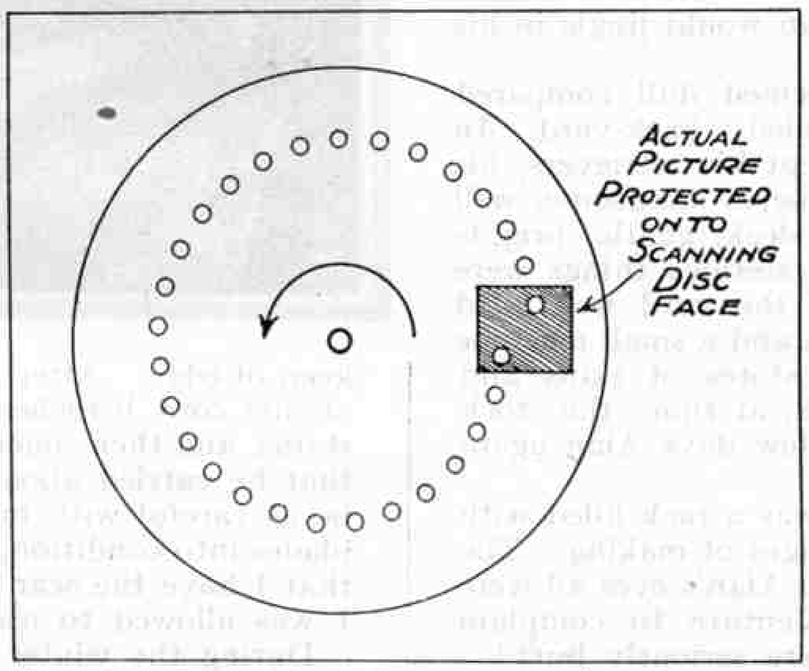


Fig. 3. How the picture is projected on the rotating disc and scanned by the spiral of holes.

Telephonic communication with the Coliseum was maintained by means of two lines. One of these connected the control rooms in the laboratories and the theatre, and the second connected the studio itself with the stage in order that the announcer on the latter should be in a position to ask questions of the individual whose image appeared on the screen.

When the time came for the demonstration to commence a preliminary trial was made by the engineer, and after the quality of the picture had been reported upon, the announcer on the stage introduced the subject to the audience and curtains in front of the illuminated television screen were then drawn back. A close watch was kept upon the picture by the engineers present in the theatre, who were in complete control both of the synchronising arrangements and of the means employed to maintain the volume of speech at the required level, an assistant in the van itself watching a reflection of the picture in a mirror and rapidly making any necessary adjustments in order to " hold " the picture in place.

Apart from the novelty of the " tele-talkies " perhaps the most interesting feature of the entire performance was " question time " at the conclusion of the demonstration. Members of the audience were invited to ask questions, and these were telephoned through to Long Acre studio by the announcer and the replies given from the screen. Most of the questions were in reality commands to the individual being televised to carry out some simple action.

Possibly the time is not far distant when all cinemas will be equipped with television screens and supplied with their programmes from a master film transmitted from a central studio. In addition there will be shown on the screen by normal television various topical events as they take place.

Holidays with a Gamekeeper

By J. C. Bristow-Noble

HOW distinctly I remember the reverence with which I regarded Alan Roberts, my gamekeeper friend, as soon as I was old enough to feel the fascination of his calling! This must have been when I was about six, and probably I was not much older when I began to follow at his heels about the woods and fields, carrying his snares and traps and often also his bag of ferrets. Now and again Alan, after some manœuvring, would shoot a jay, magpie, hawk, or carrion crow, and presently I would climb to the top of the tree to descend with the bird's young ones, thrust into pockets and the inside of my jacket.



(Above) The end of a perfect day! The terrier seems to be very proud of his "bag." (Centre) Ferreting in the woods. (Below) A pair of young magpies.

The little birds were all grist to Alan's mill. I envied the ease with which the man reared and tamed them, and also envied the birds themselves when at last their plumage became thick and lustrous, and they were capable of feeding themselves. A little later they would mysteriously disappear, and for a few days afterward Alan would jingle in his pockets more money than usual.

My own home and its surroundings seemed dull compared with Alan's cottage and his higgledy-piggledy back-yard. In the latter were the kennels in which he kept his retrievers, his fat floppy spaniel puppies, and the night dog, a handsome, well bred mastiff. There were also hutches of sleek, gentle, bright-eyed ferrets and a big copper in which mysterious things were constantly being boiled. A small shed in the yard was filled with traps, snares, nets and tools of all kinds and a small machine for loading cartridges. It also contained stores of skins and feathers. As in the case of the young birds, at times the stock of these mysteriously vanished, and for a few days Alan again would have plenty of money.

The chief attraction of the cottage itself was a rack filled with guns and walking sticks, the latter in all stages of making. The guns were old and none were too safe, but in Alan's eyes all were weapons of beauty and joys for ever. Venture to complain about one after a shot, and his feelings were seriously hurt!

"It be the way you hold her," he would say. "She be a good little gun, she be. Give her here and take this one."

The man collected the walking sticks at the rate of one or two a day during the winter. He buried them for about an hour in a trough of hot sand. When taken out they were nearly as flexible as wire, and it was easy to shape the handles. As one of these was made it was fixed in the desired position with whip-cord, which was not removed until about a fortnight later. If this precaution were not taken, the handle gradually would straighten out again as the stick cooled and hardened. Before being finished off with varnish and a ferrule, a stick was stored in the chimney corner for a few weeks in order to "season" it.

Alan sold most of the sticks to his employer's shooting guests. In imagination I can still see them gathered round Alan's door, and Alan himself, in a great state of excitement and anxiety to please and to be fair in his charges, polishing the sticks before handing them round and talking about them as if they were living things. I have one of the sticks now; it has been in use for more than twenty years.

My gamekeeper friend was neat in appearance but always blood-stained. So greatly did I admire the big and little blots of blood about his clothes that, while ratting one afternoon, I took some of the dead rats aside and decorated my own clothes with similar smears. But I was very sorry for it when I got home in the evening! Henceforth I understood that to go about blood-stained, and so to look what I considered professional and manly, was Alan's exclusive privilege.

One of the things that in the beginning had helped to make me Alan's devoted admirer was the cutting ability of his big pocket knife. The ease with which this did its work interested me greatly. At length I discovered why the blades were always so keen of edge. After use Alan invariably dried and polished them on his cord breeches, which accounted for some of the blood-stains, and then touched them up with a small piece of whetstone that he carried about with him for the purpose. I resolved to be as careful with my own knife. No sooner had I coaxed the blades into condition, however, than I slashed my leg so deeply that I have the scar to this day, and it was some months before I was allowed to use the knife again.

During the winter evenings I would sometimes sit with Alan by his fire and help him make snares, trim the sticks and clean the guns. It was chiefly on evenings spent in this manner that

I learned something of the field lore that he had gathered.

If hounds were due to meet in the district we went out at about 9 o'clock on the previous evening in order to stop the foxes' earths. The ' night dog ' and a terrier, both on leads, accompanied us, and before the earths were stopped the terrier was sent into them to bolt the foxes that happened to be at home. Suddenly we would hear the bark of the dog working its way along the ground and presently the disturbed fox would rush away into the darkness over the dead, crisp leaves and brittle twigs that carpeted the woods. The terrier generally returned panting furiously, bleeding from bites chiefly about the jaws, and very greatly exhausted from his underground chase.







(Above) A nest of baby ferrets. A gamekeeper always takes good care of his allies. (Centre) In the dining room of a barn owl, with dinner—a full grown rat—ready on the table. (Below) A partridge nest and eggs.

The Hunt paid Alan half a sovereign for a find, and a sovereign for every kill made on his beat. Foxes must have been a useful source of income to him, for he also received money for the skins of the animals that he shot and trapped. But so relentlessly did he hunt the creatures through the winter that it was surprising there were any to hunt at all.

On one quiet moonlit night we were stopping earths when suddenly we were startled by the report of a gun a few hundred yards away. Alan and the ' night dog ' exchanged enquiring serious looks.

" A poacher," the keeper whispered, and we began to go in the direction from which the shot had come. I walked a few feet behind him and I cannot say that I felt comfortable.

Presently Alan let the mastiff off the lead and the dog disappeared, sniffing the air and trotting quickly. A few minutes passed ; then we heard a roar rather than a yell, followed by a triumphant bark.

" The old dog's got 'un," Alan laughed. " Come along ; there's naught to be feared now."

When we came up to the pair the poacher was lying on his back and the dog was standing with his forefeet on the man's chest and beating the air with his tail. The keeper roughly pulled the captive to his feet and taking hold of his coat collar we set out for the police constable's cottage in the village. The man's punishment was a month's imprisonment and the loss of his gun, which Alan was allowed to keep.

Afterward I asked Alan if the dog always did his work in that manner.

" Yes," he replied, " he springs suddenly and without warning, and knocks his victims down and stands on them, same as I larnt him when a pup. He never bites, but that's something everybody doesn't know."

When teaching one to shoot Alan was most painstaking and patient, and he took great care to drive home the fact that one should never fire at a stationary object.

" It isn't sport," he would say, " and 'tain't the way to larn to shoot."

My first shot—we always remember such a great occasion as this—was at a bolting rabbit. I held the gun so loosely, and in other respects so badly, that the ' kick ' did not strike me on the shoulder, but on the mouth. A tooth was broken off, and of course, my lips were cut. All Alan's guns kicked when I used them. They were all twelve-bores, too large and heavy for me, and in addition the cartridges were loaded with the cheapest black powder. At the end of a day's shooting with him my shoulder usually was black and tender.

The spring and early summer spent in the company of the keeper were particularly pleasant. In March there were excursions in search of plover's eggs. During April, May and June there was the even more fascinating business of helping him to rear several hundred young pheasants, and in the two last named months the keeper worked from dawn until twilight. He then had the use of a pony and cart, for there were heavy coops, wire-netting, stakes and food for the young pheasants to be moved about the fields. I thoroughly enjoyed this work and his command of a pony was the secret of my being able to ride when I was about seven or eight.

During the summer the man also reared many wood-pigeons, chiefly for his own table. He would take the birds from their nests when about ten day's old, put them in a shed and feed them from his mouth with wheat that had been soaked in water for several hours and so made soft and easy to digest. The knack of pushing food into the birds' mouths with one's tongue was easily acquired, and it was quite a nice job, particularly when the little things could fly. Three or four at a time would then settle on one's shoulders and chest, and each would struggle to be the first to get its beak into one's mouth.

July and August were Alan's slackest months, and then he would take me into the coverts to see fox cubs playing and feeding. While they were in the cub stage the keeper fed and looked after the animals as carefully as he tended game. Badgers and otters in the trout stream also were strictly preserved throughout the spring and summer. Alan's motto was "A few of everything," the only exceptions to the rule being rats, stoats and weasels. The man could not find a sale for the skins of these animals and therefore expressed the very emphatic opinion that they were " good for naught."

On serious shooting days I was sometimes permitted to plod along at Alan's side. When lunch time came round a footman served the beaters, and the butler attended to the wants of the guests. As the persons chiefly responsible for the success of the day, Alan and I were privileged to sit a little distance from the guests, and to the butler's disgust, for he and Alan were very jealous of each other, to share largely in the daintiest dishes. At these times we did more than make hearty meals ; we gorged, crocodile fashion.

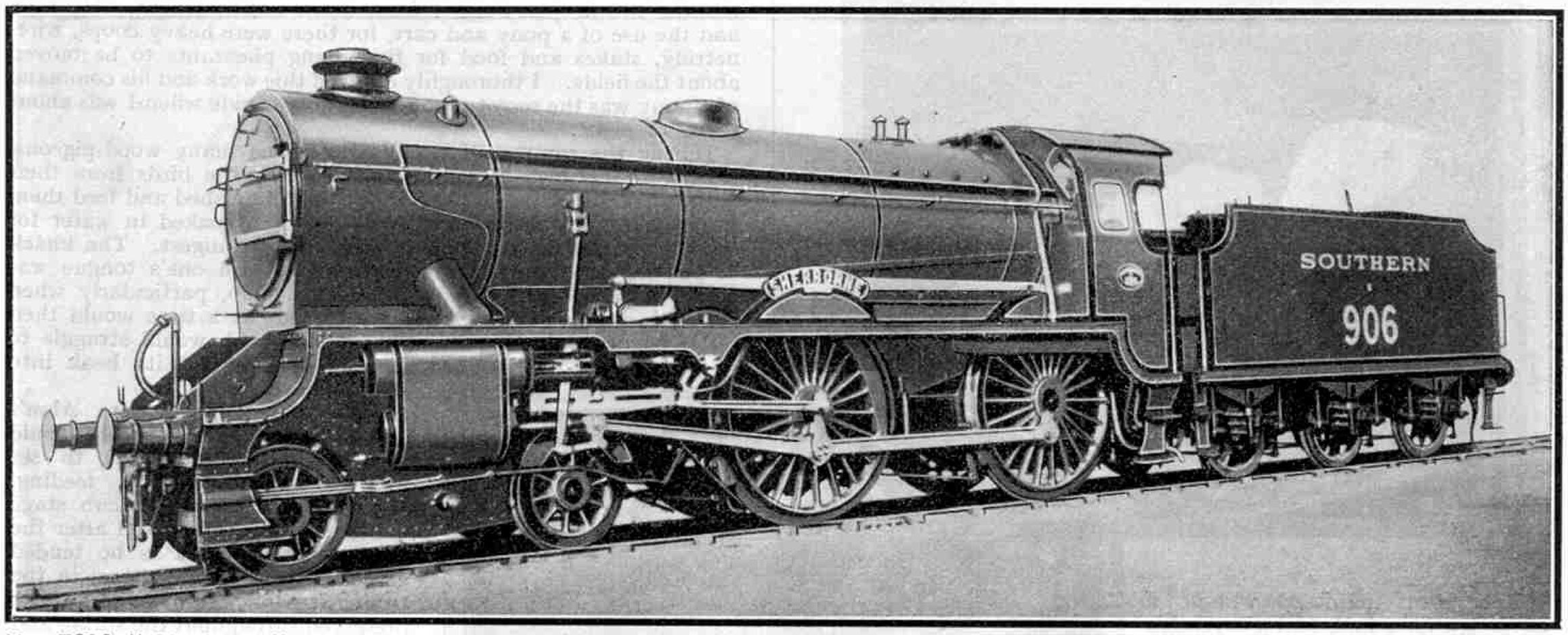
I remember that on one occasion two of the guests left glasses half full of claret. Lingering behind, Alan quickly drained one and then pounced on the second. The butler crashed two plates together and the men's employer looked round.

" It is not, Sir," said Alan in explanation, " 'cause I don't know my manners, but 'cause of him," and he (*Continued on page 808*)

On the Footplate of the "Schools"

Some Splendid Runs on the New Southern Engines

By "Observer"



No. E906, "*Sherborne*," one of the massive three-cylinder 4–4–0 locomotives of the well-known "Schools" class of the Southern Railway.

THE new Southern Railway 4–4–0 express locomotives of the "Schools" class, designed by Mr. R. E. L. Maunsell and built at Eastleigh, have already won for themselves remarkable popularity. Their drivers and firemen speak of them with enthusiastic praise, declaring that they steam freely, run easily and, with their large boilers, have a valuable reserve of power. This increase of power that the "Schools" supply was, indeed, much needed. The "L" class, whose places they are taking are really excellent engines, but the heavy loads, with the sharp timings now in force, are often beyond their powers on the extremely difficult roads on which they have to work. The enginemen therefore welcome the additional power that is at their command in the new engines.

The "Schools" have become a favourite type also with the wider public who take an interest in locomotive matters. Each of the engines as it came new from the works was placed on exhibition at the station most convenient for the famous school after which it had been named. Masters and boys from the schools, together with large numbers of the general public, seized the opportunity to inspect these magnificent engines, and all were impressed by their fine proportions. Massive power and symmetric grace combine perfectly to make them look their part as racers of the iron road.

The "Schools" class of locomotives were introduced early this year by the Southern Railway for handling heavy traffic on the difficult Hastings route. Each of them is named after a famous public school. They are the heaviest locomotives of the 4–4–0 wheel arrangement in Great Britain, weighing 67 tons 2 cwt. in working order. Their tractive effort at 85 per cent. working pressure is 25,131 lb. This is little less than that of the locomotives of the "King Arthur" class and is a record for a British locomotive of this type.

Among those who gazed with admiration on these engines there were many who keenly desired to do something more. As they surveyed the fascinating mechanism they longed to be able to ride on the footplate and travel at speed when the engine was taking a train. That, however, is a longing that can only be realised in rare cases. For very good reasons the coveted privilege of riding on the footplate can be granted only to few; but to me, as the representative of the "*Meccano Magazine*" and its tens of thousands of readers, that privilege has been given. On a recent day I was permitted to make the round trip from London to Folkestone and back in order that I might see for myself the capabilities of these engines on the road.

The working of the fast expresses between London and Folkestone calls for locomotive performance of a very high order. It is true that the average speed of these trains is not so high as that which obtains on some other main line services. The distance from Charing Cross to Folkestone is 70 miles, and the non-stop trains in both directions are allowed 80 min., giving an average speed of 52½ m.p.h. But when the weight of the trains, and the nature of the road with its congested suburban area, steep gradients and other hindrances to fast running, are borne in mind, it will be realised that to maintain such timings some really first-class locomotive work is required.

I chose to go down to Folkestone by the train leaving Charing Cross at 1.15 p.m. It was made up of 10 eight-wheeled bogie coaches, one of which was a Pullman. The tare weight was 304 tons, and including passengers and luggage the total weight behind the tender would be fully 335 tons. At the head of the train I found engine No. 903 "*Charterhouse*" in charge of Driver Morley and Fireman Smith of Deal shed. When I showed my credentials the driver received me cordially and assigned me my place at the right-hand side of the cab, where I could view easily the road ahead and observe all the operations on the footplate.

Promptly at 1.15 the "right away" signal was given. The driver opened the regulator and the engine instantly responded and moved away steadily without any slipping of the driving wheels. As the engine has three cylinders, with the cranks set at 120 deg. apart it follows that there are six puffs of the exhaust to each revolution of the driving wheels, and this gives a constant sustained draught to the fire. Even at starting there is no harsh, noisy blast, but a soft, easy and rapid puffing. The driver started with the reversing gear set in the full forward position, giving the maximum cut-off of 76 per cent., but almost immediately, while we were still on the bridge crossing the Thames, he brought it back to 31 per cent. At that he kept it, with only slight variations for almost the whole of the journey. For the start the regulator was opened to the extent only of the first small valve, and throughout the run, even on the heaviest banks, no wider opening was given, but on favourable falling grades it was considerably reduced. At times, indeed, the regulator was scarcely open at all.

Having crossed the river we cautiously threaded our way over the many points and crossings and curves that have to be negotiated in the 1.8 miles to London Bridge, to cover which distance 4 min. 25 sec. were required. On to New Cross we steadily gathered speed, but our first five miles had accounted for nearly 9 min. It was already evident that we must travel decidedly faster if time were to be kept, and Ashford, our first stop, reached at the booked average of 51 m.p.h.; but not for some miles yet should we find favourable grades where high speed might be attained. First we should have to tackle stiff grades that would fully test the pulling power of our engine. For 11½ miles, from New Cross to Knockholt, there is an unbroken ascent. Starting with 1½ miles at 1 in 140, it steepens later to 1 in 120 for 2¼ miles, and near the summit there are two more miles at this gradient. On we went through Hither Green and Grove Park, our engine puffing hard, especially as we mounted the steep approach to Elmstead Tunnel. From time to time I glanced at the pressure gauge and found that the finger stood almost constantly at 220 lb. per sq. in. The fireman was doing his part most skilfully and the boiler responded by steaming freely. Still working hard, but without any signs of strain, we passed Chislehurst, Orpington and Chelsfield. Up the heavy grade of 1 in 120 through the tunnel to Knockholt speed fell a little, but when we passed the summit we had covered the 11.6 miles from New Cross in 16 min. 30 sec., equivalent to about 43 m.p.h.—a notable achievement with so heavy a load and such laborious grades. Now at last we were aided by a falling gradient, for from Knockholt there is a sharp descent of 3½ miles at 1 in 143, down which we quickly attained a speed of over a mile a minute. The four miles from Knockholt to Dunton Green—including the passage of Polhill Tunnel, which is 1½ miles in length—were run off in 4 min. 20 sec. Now for 1¾ miles we had to climb again, this time up a gradient of 1 in 160 to the north end of the tunnel that lies a little beyond Sevenoaks Station. Passing the summit we plunged into the tunnel, and throughout its two miles' length we rapidly gathered speed, for we were now descending at 1 in 144.

Tunnels, of which this route has plenty, are the weirdest part of riding on the footplate, and the first experience of passing through one is rather alarming. Except for the glare of the fire when the fire-box door is open, or the escape of sparks from the chimney, all around is in densest gloom. The air is thick and sulphurous, and the din is terrific. But we rush on in perfect safety, and soon we catch the welcome sight of daylight through the exit ahead. As we emerge again into the sunshine and clear air we gaze with renewed delight upon the landscape, which seems all the more beautiful in contrast with the blackness through which we have just passed.

And now we were really speeding, and there was urgent need for it if time were to be kept, because the 22 miles to Sevenoaks had swallowed 31 min. 10 sec. Past the Weald Box and through Hildenborough, down a gradient of 1 in 122 we raced, attaining a maximum speed of rather more than 75 m.p.h. Even at this pace the engine rode astonishingly easily, due partly to the excellence of its construction and partly to the perfection of the permanent way. By this time I had found my "sea legs," and I could stand on the footplate for mile after mile balancing myself easily, thus having both hands free to write my notes and take my timings.

All too soon this glorious burst of speed had to be checked, for we were nearing Tonbridge Junction, which must be passed at reduced speed. Steam was shut off, therefore, and the brakes were applied. For the 29.5 miles from Charing Cross to Tonbridge the working timetable gives what is really a very tight allowance of 38½ min., but as I looked at my watch I found that we had kept it exactly. "On the dot!" I shouted to the driver, and he answered with a nod and a modest smile.

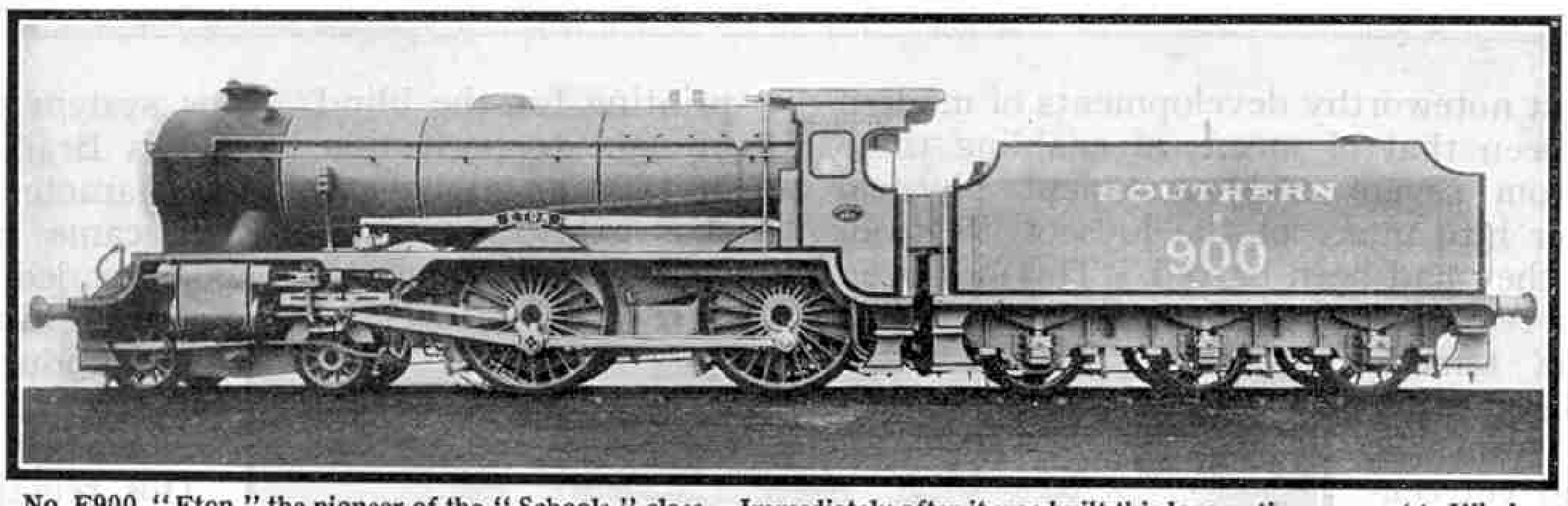
We wound our way slowly past the junction and round the curve beyond, and then away we went, gaining speed quickly on the falling gradient to Paddock Wood. For miles ahead the line lay perfectly straight, but undulating. Paddock Wood, 5.3 miles from Tonbridge, was passed in 6 min. 10 sec.; the 7.1 miles to Staplehurst took only 6 min. 20 sec., and 70 m.p.h. was attained again. The ascent at 1 in 244-266 to Pluckley brought down our speed but little, and we continued to run well until steam had to be shut off for the stop at Ashford. The approach to the station was made very slowly, and we finally stopped 35 sec. before 2.21 p.m., the time at which we were due. The 26.6 miles from Tonbridge had been covered in 26 min. 55 sec.

Station duties at Ashford occupied nearly 4 min., and we were 15 sec. late in starting. For the eight miles from Ashford to Westenhanger the line rises, the last four miles being at 1 in 276; but we made good running. At Smeeth a slight curve breaks the long dead-straight line, and near to Sandling Junction there is another short tunnel. After Westenhanger falling grades helped our speed which rose to 70 m.p.h. before we passed through Shorncliffe and slackened for the stop at Folkestone. We came to a stand at 42 min. 20 sec. past two, 40 sec. before time; the 13.9 miles from Ashford having taken 18 min. 5 sec. Here I descended from the footplate, but the engine and the front half of the train went forward to Dover and Deal.

Reviewing my trip, I felt that it could truly be described as extremely satisfactory. I had enjoyed every moment of it. Except for one slight shower the weather had been fine. We had been given an absolutely clear road; only once did we find even a distant signal "on" and this came "off" just as our driver sounded a challenging whistle. The engine had done more than was required of it. It had improved on schedule time, yet was never once extended, and even when it was working hardest there was quite evidently a reserve. Only rarely could I catch the sound of the exhaust. I kept a constant-watch on the pressure gauge and found it always close on the working pressure of 220 lb.; and even on the stiffest banks the steam supply was fully maintained. Driver Morley won my admiration by his quiet efficiency; he was the sure master of his job all the time. I must add that Fireman Smith not only fired skilfully, but kept his footplate so clean that at the end of the trip I found myself surprisingly free from the grime that one usually gathers on a footplate run.

I returned from Folkestone by the 5 p.m. train that is timed to run non-stop to Charing Cross and to do the 70 miles in 80 min. My hope that a "School" would be working the train was realised, for when the portion from Deal and Dover ran into Folkestone Central the engine proved to be No. 906 "*Sherborne*" with Driver Weaver of Dover in charge and Fireman

(Continued on page 822)



No. E900, "Eton," the pioneer of the "Schools" class. Immediately after it was built this locomotive was sent to Windsor where it was eagerly inspected by large numbers of boys of Eton College.



Photo] *[J. M. Craig, Glasgow*

The "Folkestone Express" passing Chelsfield, hauled by No. E900, "Eton." It will be noticed that the upper portions of the cab and the tender sides are set in; the object of this is to clear the restricted loading gauge of the Hastings route, for which these locomotives were designed.

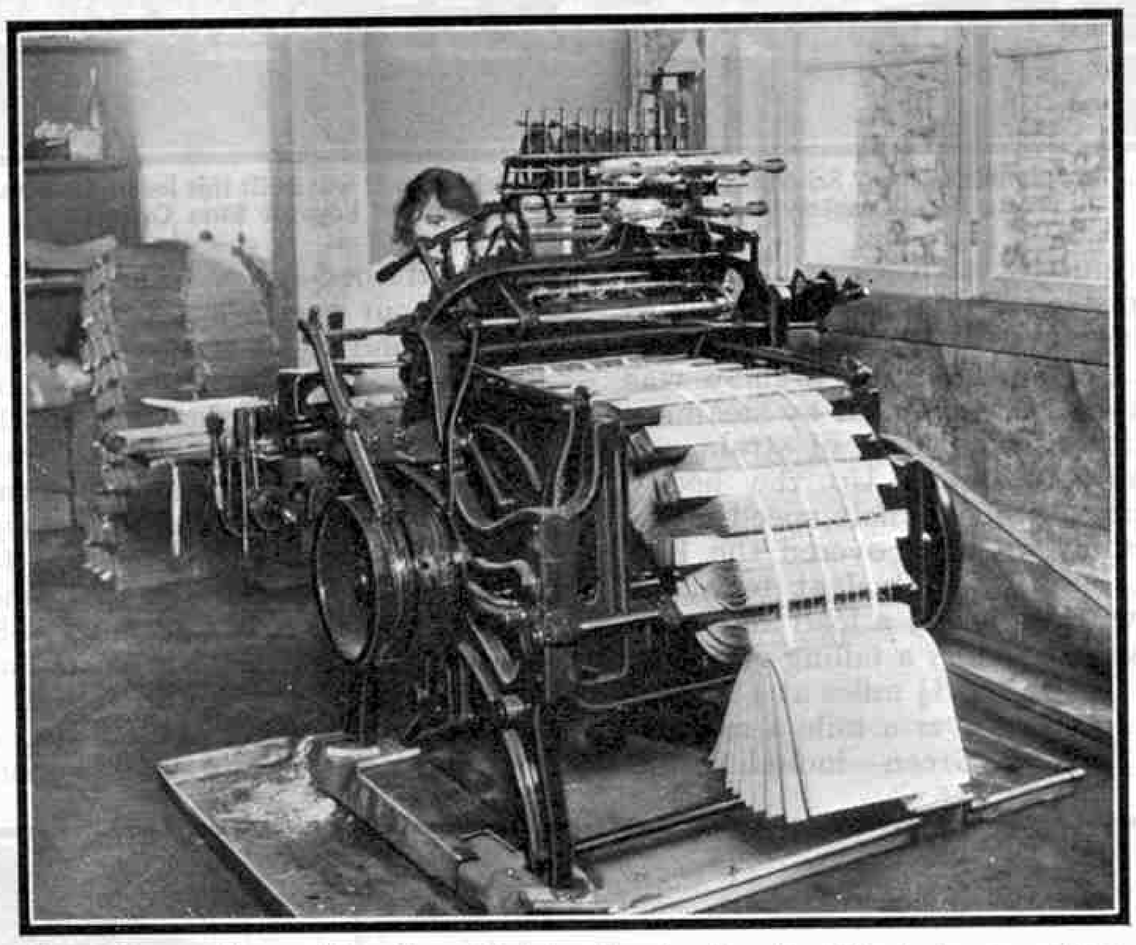
Mechanical Wonders to Aid the Blind

Work of the American Braille Press in Paris

By Francis Dickie

ONE of the most noteworthy developments of modern times has been that of means of enabling those suffering from severe and permanent physical handicaps to enter into many of the joys of life from which previously they had been barred. This has been notably the case in regard to the blind. The terrible affliction of blindness seems to have existed from the earliest times, and yet century after century passed by without any steps being taken to find means of compensating to some extent for the lack of this sense. Up to the latter part of the 18th century the blind were mainly a class of paupers. They could do nothing to help themselves, and no one thought of helping them beyond the giving of alms to enable them to keep alive.

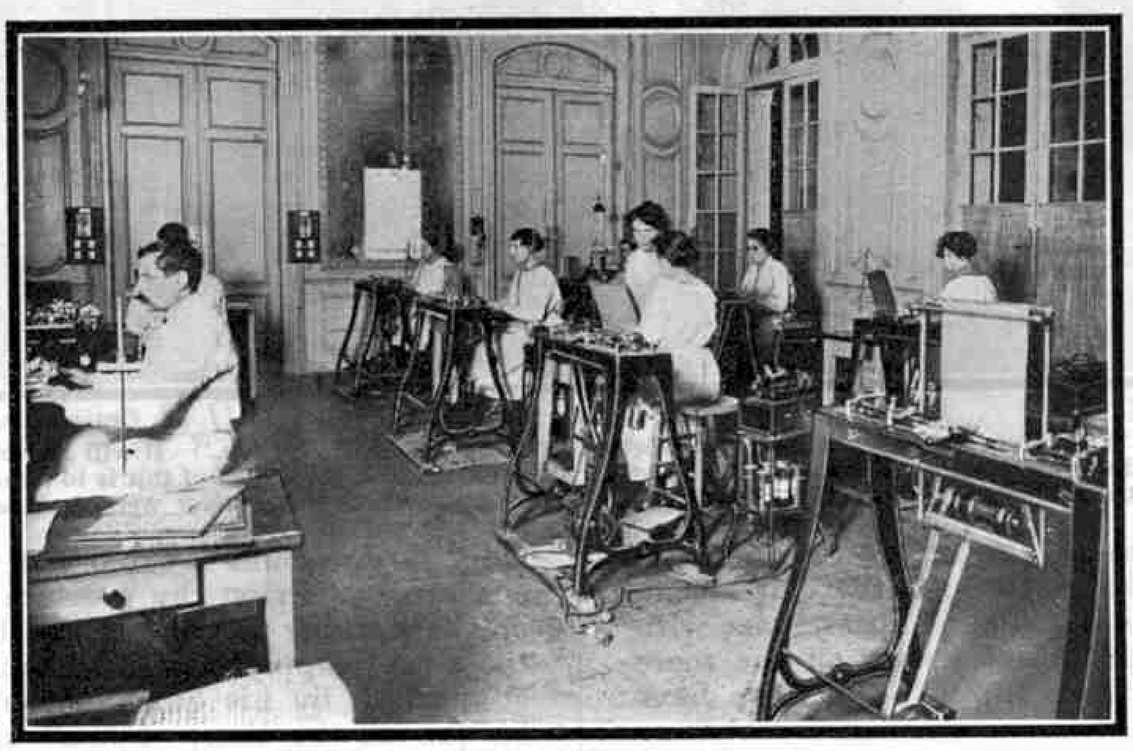
A great change in this state of affairs was brought about by the French philanthropist Valentine Hauy (1746-1822). Hauy, who was a man of considerable means, was deeply moved by the pitiful condition of the blind in France, and especially by the fact that begging formed almost their only means of making a living. He realised that the only way to improve matters was to teach the blind so that they could help themselves. He set to work to acquire all the information he could in regard to the blind, and at the same time he undertook the education of a blind boy named Lesueur, who previously had been a beggar at a church door. With infinite patience Hauy taught this boy to read ordinary metal type by the use of his finger tips. The method was successful to a certain extent, but it was clumsy and it offered no means of wider distribution. Then one day the boy's fingers accidentally encountered a piece of thick paper upon which some heavily driven type had made a slightly raised impression that could be read by the sensitive fingers; and through this discovery came about the invention of the dot system of printing for the blind. This system was subsequently brought to perfection by Louis Braille, who produced in 1829 an alphabet of dot characters that proved so thoroughly practical that it came into general use.



A high-speed machine for stitching books for the blind, in operation at the Braille Press headquarters in Paris.

The great drawback to the extended use of the Braille system was that methods of production of printed matter in this type were extremely crude and slow. This remained the case up to the end of the Great War, when a great improvement was brought about by the establishment of large headquarters in Paris by the American Braille Press.

Though Paris has been chosen as the most central place from which to supply the needs of the world's blind, the Braille Press was founded by William Nelson Cromwell, a New York lawyer, and since its commencement at the end of the Great War has been carried on by funds supplied by Americans. Before the organisation undertook the task of increasing the output of reading matter and music for the blind, most of the work was done by hand and the output inevitably was small. Now, with the aid of new machinery and of a vast distributing system, the Braille Press has become the greatest welfare work of its kind in the world. Many million pages of Braille have been printed in six languages and distributed in 40 countries. The greatest single publishing achievement is the production of the French Encyclopædia Larousse in 22 volumes; the greatest fiction publication is Dumas' "Count of Monte Cristo" in 20 volumes. In addition to all this, thousands of pages of music are printed and distributed throughout the world. The Braille is set up in three styles—fully spelled for beginners, slightly abbreviated, and greatly abbreviated for experienced readers.



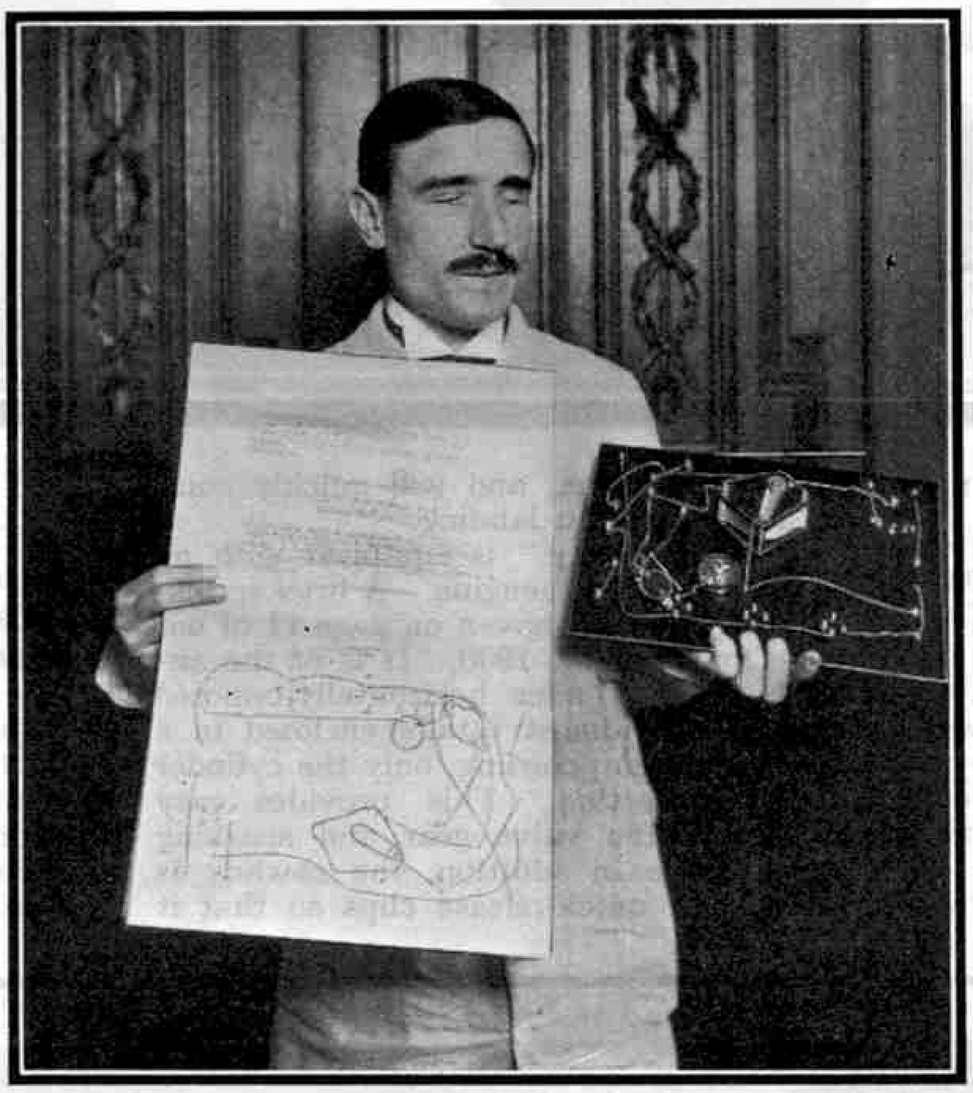
Blind operators, working from dictaphone records, setting up type for the blind upon stereotyping machines.

The headquarters of the American Braille Press are in a vast old mansion at 74, Rue Lauriston, Paris, once the ancestral home of the Duc de Clermont Tonnerre.

In this building, now transformed into a great printing shop with the most modern machinery, the work is carried on by a staff of some 50 people, nearly all of whom are blind. In one big room are the motor-driven stereotypers that stamp the Braille type on both sides of thin zinc sheets. This very ingenious invention is known as "interpoint." By a careful method of spacing it makes possible the utilisation of both sides of the sheet, thus reducing the always bulky volumes to about half their former thickness. The finished volumes are 13½ in. by 10½ in. and each contains 100 pages.

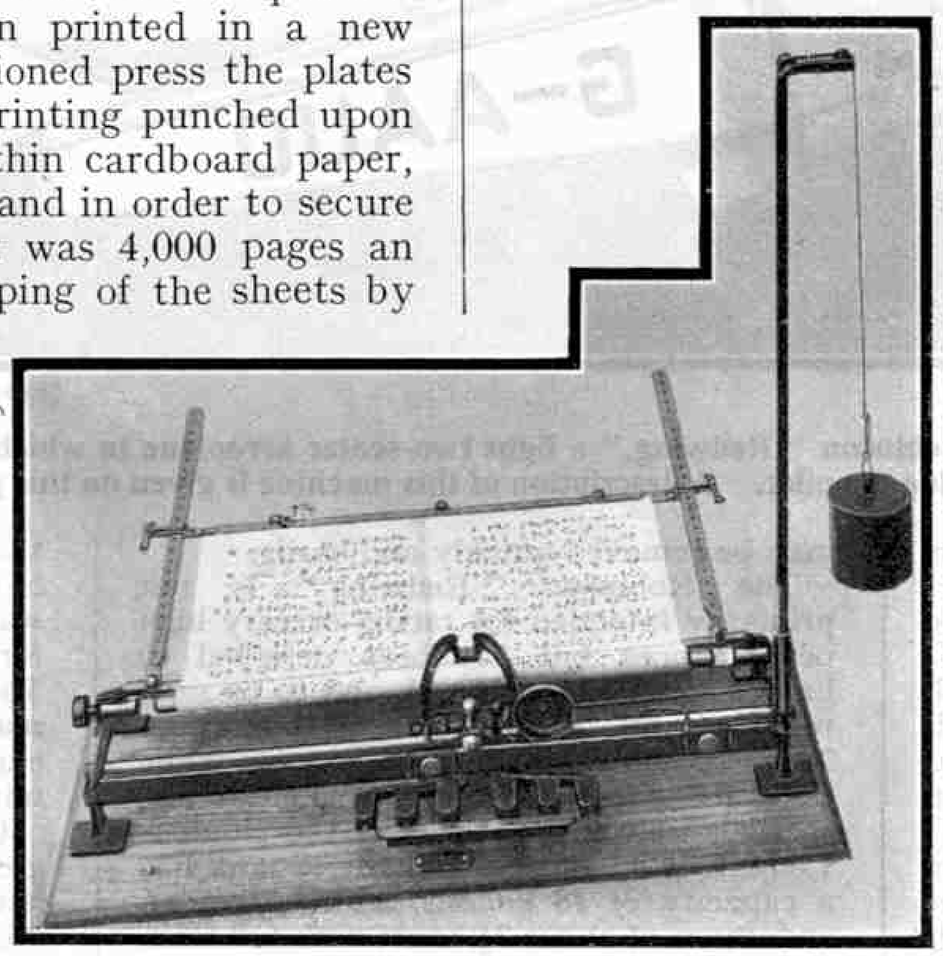
The setting up of the printed Braille type is exceedingly interesting. The material is first read into dictaphones by a person with normal sight. The cylinders are then taken to the composing room and placed in reproducing dictaphones, and the blind operators of the stereotype machines take the dictation through earphones. The operators work by means of a keyboard, and the letters they touch are punched by the machines on the zinc plates. Each plate makes a page of print, or a page of music. Before the plates are transferred to paper they are proof-read by a blind operator by passing his finger tips over the raised points. Any corrections that are necessary are then made; misplaced dots being pounded down by means of a small hammer, and omitted dots added by the use of a small steel-pointed instrument. The plates are then printed in a new high-speed press. In the old-fashioned press the plates were put in flat and the dotted printing punched upon them was conveyed to a special thin cardboard paper, which first had to be damped by hand in order to secure the best impression. The output was 4,000 pages an hour. In the new press the damping of the sheets by hand is done away with, and the output is 12,000 pages per hour. Finally the printed sheets are stitched together by a high-speed machine, which has superseded the previous process of stitching by hand.

During the past ten years many ingenious contrivances have been invented with the object of extending the scope of the Braille system. For instance, boards have recently been produced by means of which the blind may enjoy the thrills of the crossword puzzles that have provided amusement for millions of sighted people. The method of solving these puzzles by reading with the finger tips was originated by a young Frenchman, Morris Anceaux, who is himself blind. His first invention consisted of a brass board fitted upon a frame of wood that raised it sufficiently to hold small nails with large heads. The board had 11 squares each way, six holes being bored by hand to each square; and into these holes were fitted brass nails that made dots in Braille. The idea was at once tested by the American Braille Press and found satisfactory, but far too expensive to manufacture. It is the aim of the Braille Press to supply things either free, or at cost to those who wish to pay; and therefore experiments were commenced with the object of producing the boards at a cheaper rate.



Relief diagram and skeleton frame by means of which blind people can build their own wireless sets.

Several cheaper designs were produced, but they all suffered from the defect that the boards had to be drilled by hand, and in consequence the price inevitably remained high. Then one day the workman in charge of the Braille Press machine shop conceived the brilliant idea of using one of the sheets of zinc upon which the Braille dots are stamped by the stereotypers. By lengthening the points on one of these stereotypers he made it possible to drill holes through the zinc sheet, and thus solved the problem of producing crossword puzzle boards rapidly and cheaply. By leaving a strip of zinc round the squares and turning this down after the perforations were made, a rim was formed that raised up the board so that the metal nails had a clear space beneath. A further improvement was to make the boards with 15 squares each way instead of 11 as in the original invention. Within a week from the time the first of these cheap boards was produced, 2,000 of them were delivered to the blind in England.



A typewriter for the blind. The carriage is operated by the pendulum on the right, and the machine writes on both sides of the paper.

Another important invention is a frame by means of which algebra and the higher mathematics may be taught to the blind by means of the symbols familiar to those of us with sight. This frame is the invention of a Pole named Vlodzimierza Dolanskiego, who lost his sight and his left arm in an accident a few years ago. This disaster forced him to abandon his profession as a musician, and he devoted himself to mathematics. The particular importance of his invention requires a little explanation. Teachers have found that a blind child of normal intelligence learns more rapidly when working in company with normal sighted children than when working alone or with others who are blind. The chief drawback has been that the teacher, in demonstrating a problem on a blackboard to a normal class, could not explain it at the same time to the blind pupil. The new frame, which makes use of the ordinary figures, letters and

(Continued on page 808)



The Robinson "Redwing" Light Aeroplane

An interesting new type of aeroplane is the Robinson "Redwing" now being produced by the Robinson Aircraft Co. Ltd., of Croydon. The machine is a biplane, and is equipped with an 85 h.p. A.B.C. "Hornet" engine. It seats two persons, who are accommodated side-by-side, and has been designed expressly for the owner-pilot, flying school work, and light commercial use.

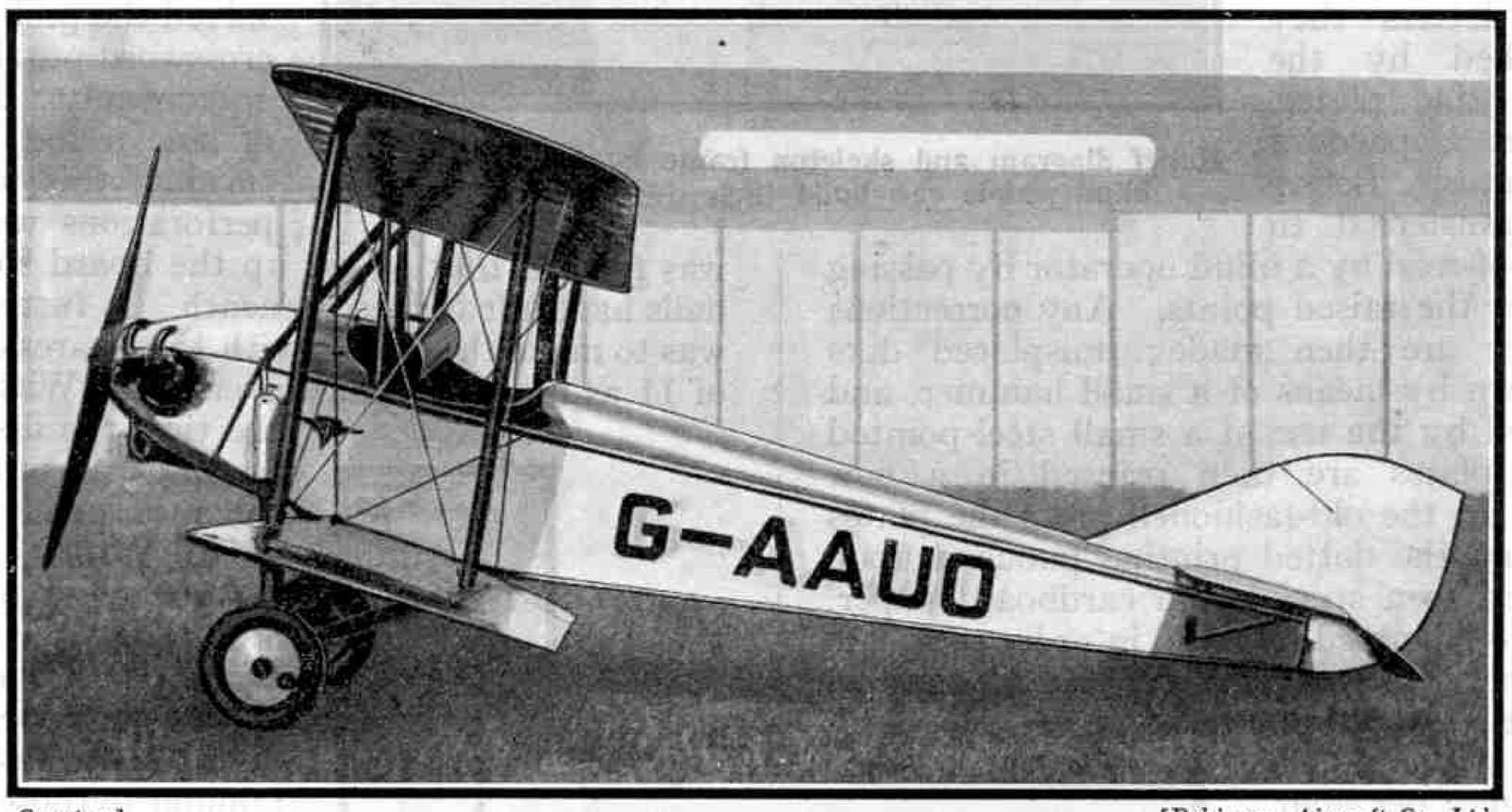
The fuselage of the "Redwing" is of the three-ply box girder type, with spruce longerons and diagonals covered with three-ply. The cockpit is directly below the upper wing and is very roomy. The two seats are slightly staggered in order to give the pilot an unobstructed view and to provide more room for both occupants. Easy access is obtained to the cockpit by means of a side door.

In order to make it suitable for the private owner, the "Redwing" is fitted with a large luggage compartment immediately behind the cockpit, and a novel feature of the machine is that each is delivered complete with two suit cases! It is interesting to note that the aeroplane is fitted with a new type of "Oleo" shock absorber undercarriage in which all valves and springs have been eliminated. The main loads are taken partly by oil and partly by rubber buffers that are always in compression. Any tendency to "bounce" is prevented by the use of double acting Oleo legs. In these oil pressure restrains the leg from extending quickly after compression from the shock due to landing, an arrangement that holds the aircraft on the ground.

The wings are folding and are fitted with a special device by means of which both may be folded or unfolded, and locked in their new position in less than a minute. The wings have a large angle of incidence when the aircraft is on the ground, this feature ensuring that the machine will rise after a short run, and will quickly come to a standstill on landing.

The "Redwing" is equipped with an A.B.C. "Hornet" engine. A brief specification of this was given on page 11 of our issue for January, 1930. It is of the air-cooled four-cylinder horizontally-opposed type and is almost totally enclosed in a neat aluminium cowling, only the cylinder heads projecting. This provides easy access to the valve gear and sparking plugs, while in addition, the cowling is fitted with quick-release clips so that it may be removed quickly and easily.

The Robinson "Redwing" is not primarily intended for racing or very high performances, but has been designed to have a slow landing speed, and to be safe, reliable and economical in operation. The maximum speed is 92 m.p.h., while the cruising speed is 84 m.p.h. The landing speed is only 30 m.p.h., and the climb is 1,000 ft. in 1½ mins. The petrol tank has a capacity of 15 gallons, which gives an endurance of about 3½ hours with full load. The wing span of the machine is 30 ft. 6 in., and the folded span 9 ft. 8 in. The length and height is 22 ft. 3 in. and 8 ft. 4 in. respectively, while the weight empty is 805 lb., and fully loaded, 1,325 lb. The "Redwing" is supplied with an Air Ministry Certificate of Airworthiness in the full aerobatic category at an all-up weight of 1,150 lb., and in the normal category at an all-up weight of 1,325 lb.



Courtesy [*Robinson Aircraft Co. Ltd.*

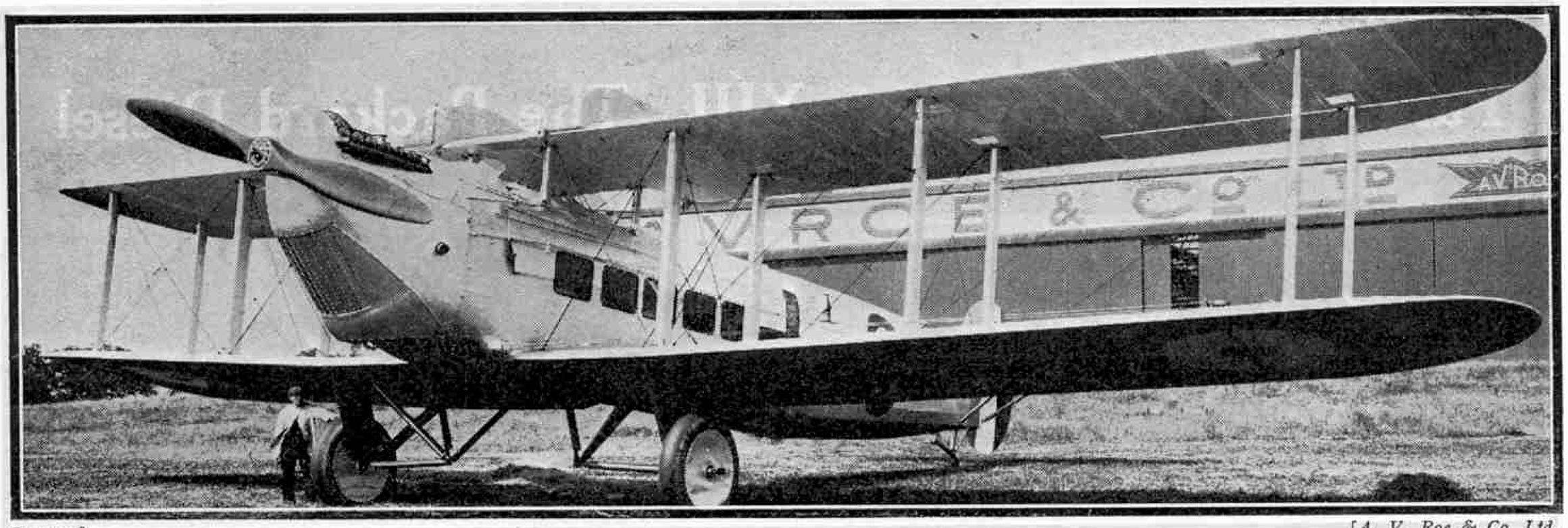
A side view of the Robinson "Redwing," a light two-seater aeroplane in which the passenger sits alongside the pilot. A description of this machine is given on this page.

Paris to New York by Air

The third and most remarkable of flights in a westerly direction across the Atlantic Ocean was made recently by two French airmen, Captain D. Costes and Lt. M. Bellonte. In their aeroplane, the "*Question Mark*," they left the aerodrome at Le Bourget at 10.55 a.m. on 1st September, and landed at Curtiss Field Aerodrome, New York, at 7.12 p.m. on the following evening, this being shortly after midnight next day, according to European time reckoning. The journey occupied 37 hours 18 minutes. It was longer than the distances covered by previous airmen who have made trans-atlantic flights in the same direction, for it will be remembered that the two previous flights commenced in Ireland and ended, the one at Greenly Island, Labrador, and the other in Newfoundland.

The actual flight of the French airmen over the Atlantic Ocean occupied 18 hours. This constitutes a record for the journey from East to West but it is interesting to note that the record for the overseas crossing is that set up in 1919, when the Atlantic was first conquered by the British airmen, Sir J. Alcock and Sir A. W. Brown. This flight was made in a Vickers "Vimy" machine, equipped with Rolls-Royce engines, and occupied only 16 hours 12 minutes.

Captain Costes also has several other great flights to his credit. In 1927 he flew round the World, his journey of 35,944 miles occupying 338 flying hours. During this flight the airman crossed the South Atlantic Ocean, flying from Paris to South America in two stages. He made another remarkable flight in September, 1929, when he set up a world's endurance record of 5,200 miles by flying non-stop from Paris to Harbin in Manchuria. This record was set up in the same machine that Captain Costes used on his trans-atlantic flight.



Courtesy] [*A. V. Roe & Co. Ltd.*

An Avro "Andover" biplane. This machine was designed primarily for use as an ambulance, but it has been greatly used also for commercial purposes. The red cross may just be distinguished between the windows and the international mark on the fuselage.

By Flying Boat to America

An excellent flight from Germany to Canada has been made in a Dornier "Wal" flying boat piloted by Herr Wolfgang von Gronau. This was not a trans-atlantic flight of the sensational type but was a carefully planned effort to mark out a route over which a safe and reasonable service could be established between the Old World and the New. It was commenced at Warnemünde on the southern coast of the Baltic Sea. The first call was made at Reikjavik in Iceland, and from there von Gronau flew to Ivigtut in Greenland, completing his task by successive flights to Cartwright, Labrador, and Queensport Harbour in Nova Scotia. It will be seen that Herr von Gronau practically followed the route adopted by the U.S. army aviators who flew round the world in 1924.

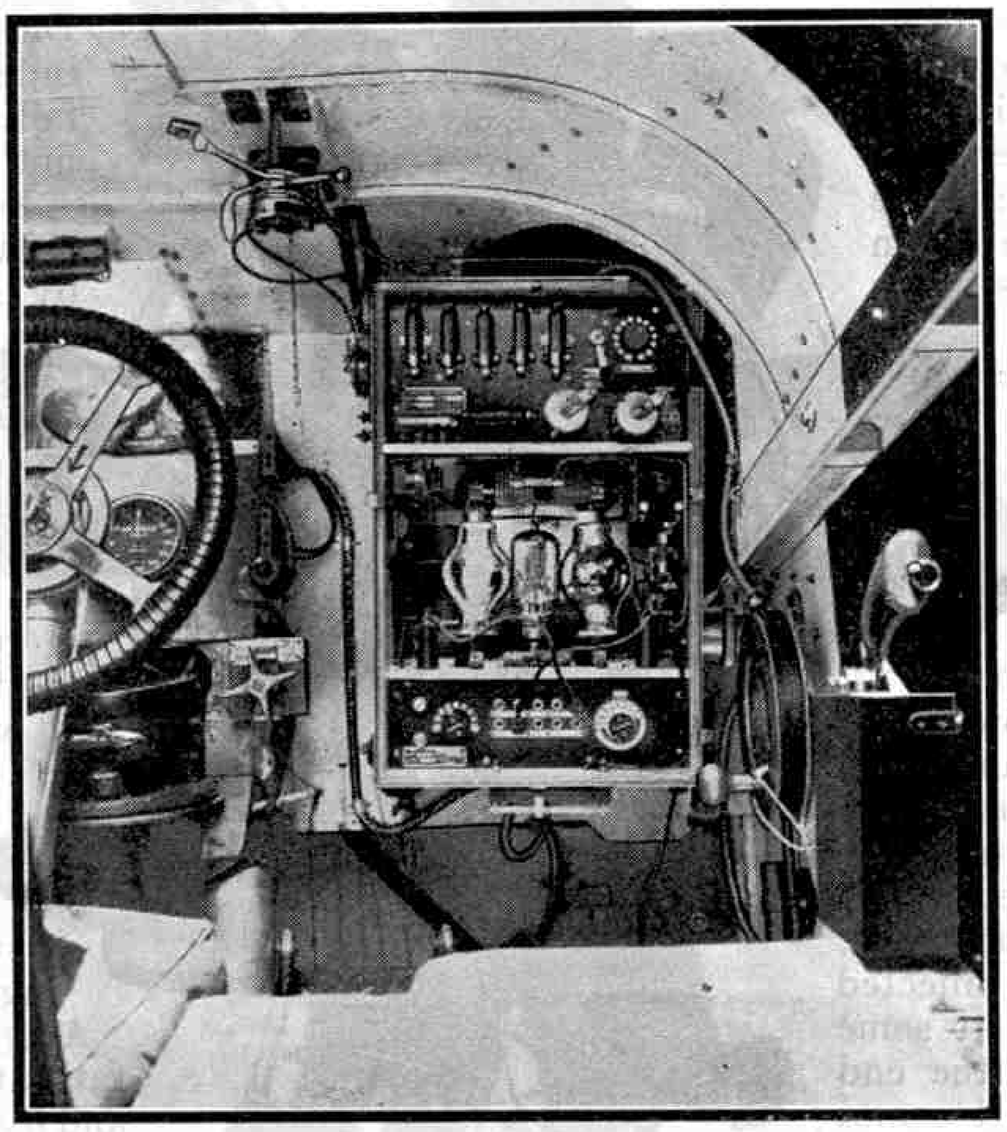
The Dornier "Wal" machine used in this attempt has had an interesting career. It was constructed in 1924 and in it Roald Amundsen, the famous Norwegian explorer, made a sensational effort to reach the North Pole by air. Amundsen's party flew north in two machines, one of which was wrecked during the expedition. Later the flying boat was employed during the search for the survivors of the ill-fated airship "*Italia*," which was wrecked during an Arctic flight. It was afterwards sold to two Norwegians who made extensive use of it. The boat was fitted with new engines in 1927 and in it Captain Courtney made his unsuccessful effort to cross the Atlantic Ocean in a westward direction via the Azores. After a period of service in the German Air Traffic Flying School it was flown to Iceland and back in 1929, and immediately before being flown to America by von Gronau it had been extensively employed in Finland.

Cotton Airscrews on the "*Southern Cross*"

The three airscrews fitted on the "*Southern Cross*," the machine flown across the Atlantic Ocean by Wing-Commander Kingsford-Smith, were made from micarta, a material that consists principally of cotton! The process of manufacture of the "cotton airscrews" has been kept secret, but it is known that they are made by impregnating layers of ordinary canvas with certain chemicals and compressing them. The result is a substance that combines steel-like hardness with the property of resistance to the effect of water.

The new type of airscrew is of especial value for service in seaplanes and flying boats, the blades being tipped with bronze or brass when used for this purpose. It also has been found highly successful in India and other tropical countries, where the humidity of the atmosphere is always fairly great. Another advantage is that each blade is a unit that may be detached from the hub. Thus if only one blade is broken in an accident, it is not necessary to replace the entire propeller.

It is interesting to note that Wing-Commander Kingsford-Smith has used micarta airscrews constantly for some time, and that he chose them for his flight from California to Australia some two years ago.



A view in the cockpit of a giant air liner, showing the wireless installation.

To Africa and Back in 36 Hours

The capabilities of the modern light aeroplane were shown in an interesting flight to Tangier and back by Mr. C. D. Barnard, the well-known British airman. The machine employed was a D.H. "Puss Moth" fitted with a "Gipsy III" engine, and the journey was made in two days, the actual flying time being only 36 hours. The engine was run at 2,000 r.p.m. and throughout the flight the speed of the machine was practically constant at 110 m.p.h.

The flight was an interesting demonstration of the comparative costs of travel by air and on the surface. The petrol consumption was 20 m.p.g. and the total cost of fuel and oil used on the journey was £11. A first-class return passage by boat and train between London and Tangier costs £19/6/8, thus allowing a good margin for the expenses of air travel in addition to the cost of fuel and oil actually used. A further advantage of travel by air is the economy in time, for even if connections could be made without delay, the journey by boat and train would occupy practically three days.

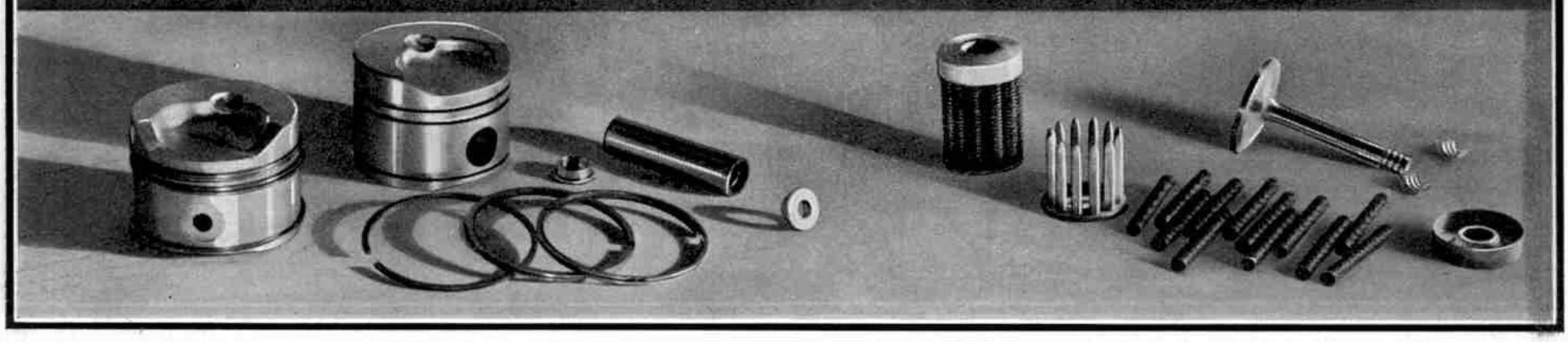
Special Pillar-Boxes for Air Mail

It has been announced by the Postmaster-General that a standard air mail fee, including both surcharge and ordinary postage, is now in operation between England and all parts of Europe. The fee is 4d. for the first ounce, and 3d. for each subsequent ounce. Letters may be posted at any Post Office or in a pillar-box in the usual way.

In the principal centres of London special pillar-boxes have been installed in which air mail may be posted. These are painted blue in order to distinguish them from ordinary pillar-boxes, and are quite unmistakeable. In them may be posted air mail to all countries covered by the air mail routes, including that to India, and letters which are posted in these boxes are collected at as late an hour as possible to connect with out-going air mail liner.

It is interesting to note that similar boxes are to be installed in Liverpool, Manchester and Birmingham. These cities are now linked with London by a regularly-operated air-mail service.

Famous Aero Engines XIII. The Packard Diesel



THE aircraft engines already dealt with in this series have all been designed to use petrol as fuel. This month we deal with an engine of the Diesel type, using crude oil.

The use of Diesel engines for aircraft has been a subject of considerable discussion during the past few years, but until recently it was very generally assumed that, although this type of engine had many advantages, it would be an extraordinarily difficult matter to make one sufficiently light for aircraft propulsion. The Packard Diesel aircraft engine shows that this difficulty can be successfully overcome. Before passing on to describe this engine in detail it will be interesting to compare the operation of the Diesel engine cycle with the Otto cycle principle upon which nearly all petrol engines operate.

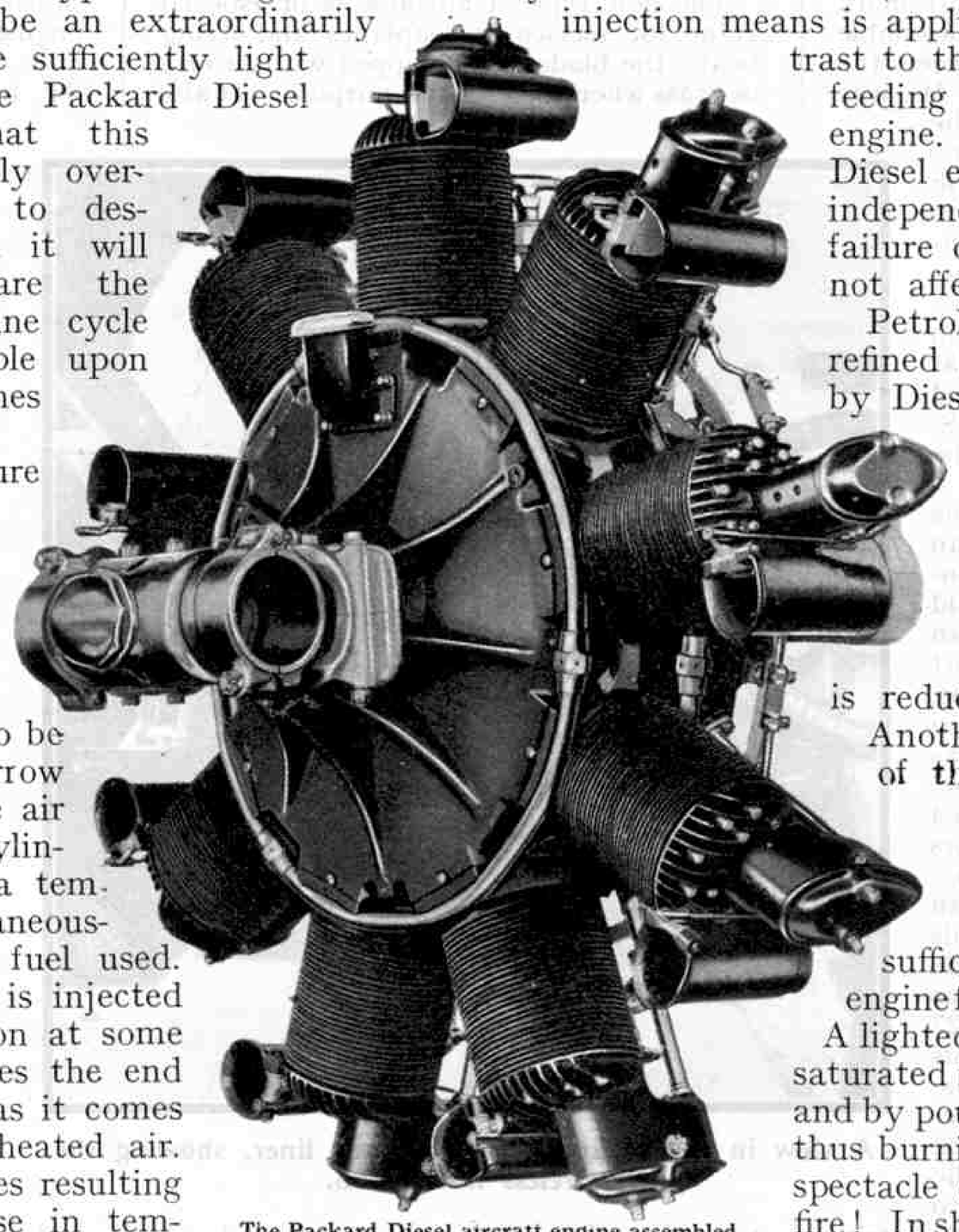
The real point of departure between the two systems is the method of ignition involved. In the petrol engine an electric spark is used to fire a combustible mixture of petrol vapour and air, the ratio of petrol to air having to be maintained within rather narrow limits. In the Diesel engine air alone is introduced into the cylinders, and is compressed to a temperature far above the spontaneous-ignition temperature of the fuel used. Consequently, when the fuel is injected in a highly atomised condition at some time before the piston reaches the end of its stroke, the fuel burns as it comes in contact with the highly heated air. The greatly increased pressures resulting from the tremendous increase in temperature brought about by this combustion, acting on the pistons, drive the engine.

The petrol engine requires a complicated electrical ignition system in order to fire the combustible mixture, whereas the Diesel engine generates its own heat to start combustion by means of compressed air. The fuel is injected in an atomised condition at the instant when combustion is desired, and the quantity of fuel injected controls the amount of heat generated. Thus in the Diesel engine the smallest quantity of fuel is burned just as efficiently as a full charge, whereas in the petrol engine the mixture ratio must be kept reasonably constant, involving the use of a sensitive fuel-and-air metering device known as a carburetter.

The Diesel engine is inherently more reliable than the petrol engine because, first, the electrical ignition system is eliminated; and second, a separate fuel injection means is applied to each cylinder, in contrast to the use of a single carburetter feeding several cylinders in a petrol engine. This means that in the Diesel engine each cylinder operates independently of the others, and the failure of any one fuel pump would not affect the other cylinders.

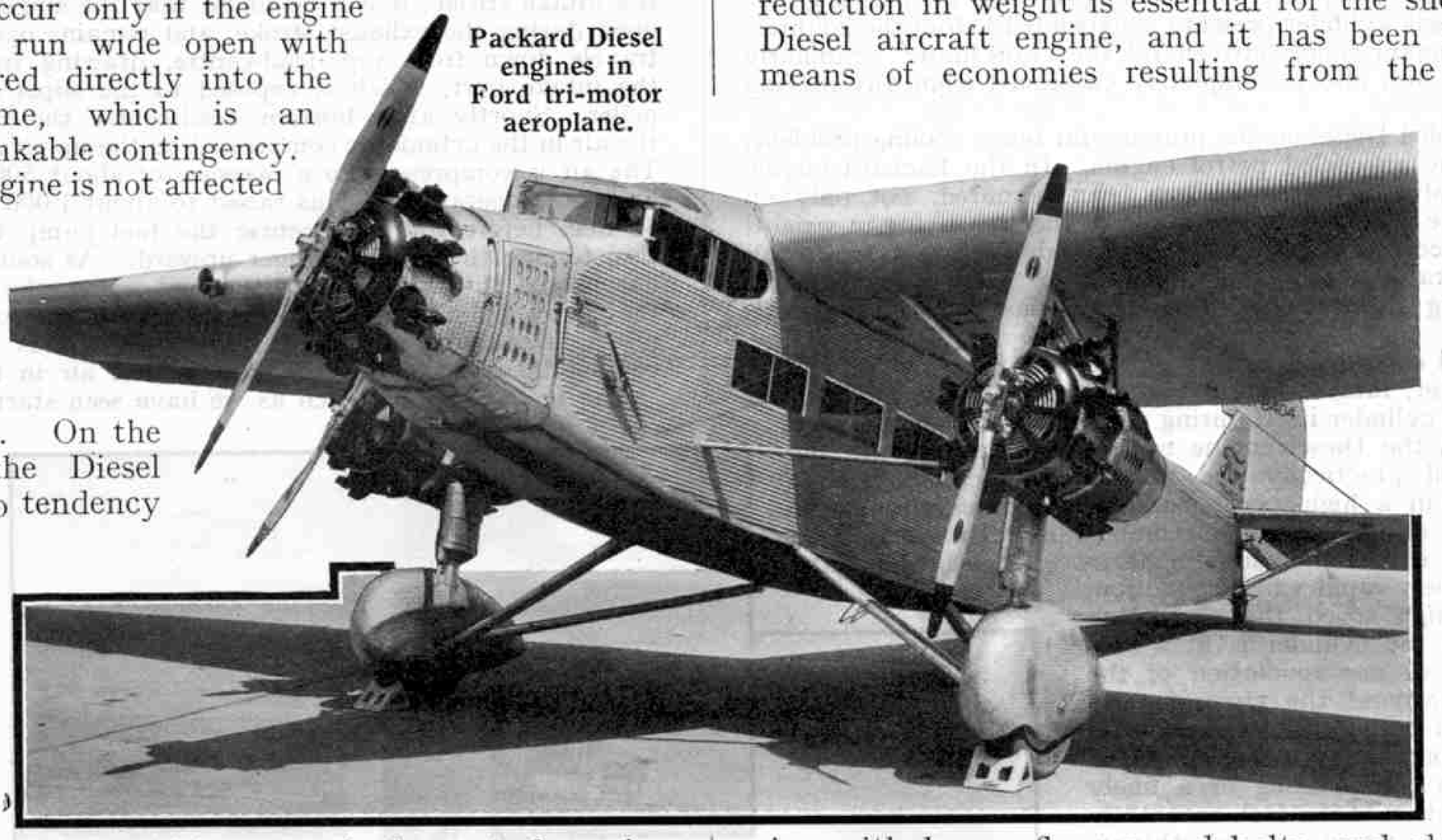
Petrol engines employ a highly refined fuel, whereas the fuel used by Diesel engines corresponds more closely to the crude petroleum oil as it issues from the wells. The cost of Diesel fuel, therefore, is very much lower than that of petrol. In addition, the actual consumption of fuel is reduced by about 20 per cent. Another important point in favour of the Diesel engine for aircraft is the greatly reduced danger from fire. The inflammability of petrol is only too well known, but it is not sufficiently realised that Diesel engine fuel is almost non-inflammable. A lighted match cannot ignite it, cloth saturated in it can only burn like a wick, and by pouring more of the oil over a rag thus burning we can watch the curious spectacle of the oil quenching its own fire! In short, it is practically impossible to ignite this fuel at all until it has been atomised into a very fine spray.

In the laboratory work that is carried out in the development of new types of petrol aircraft engines, petrol fires are of frequent occurrence; but in the course of more than a year's laboratory work with the Packard Diesel engine not a single fire occurred. There were many instances of fuel lines leaking or even breaking off, but at no time did a fire result, even when the fuel was flowing in a full stream over



The Packard Diesel aircraft engine assembled with propeller hub, showing streamlined rocker-arm boxes and shutter valves in air tubes. For the illustrations to this article we are indebted to the Packard Motor Car Company, Detroit.

the heated engine. Experience seems to justify the statement that fire after a crash of an aeroplane equipped with a Diesel engine would be practically impossible, and could occur only if the engine continued to run wide open with fuel oil poured directly into the exhaust flame, which is an almost unthinkable contingency.

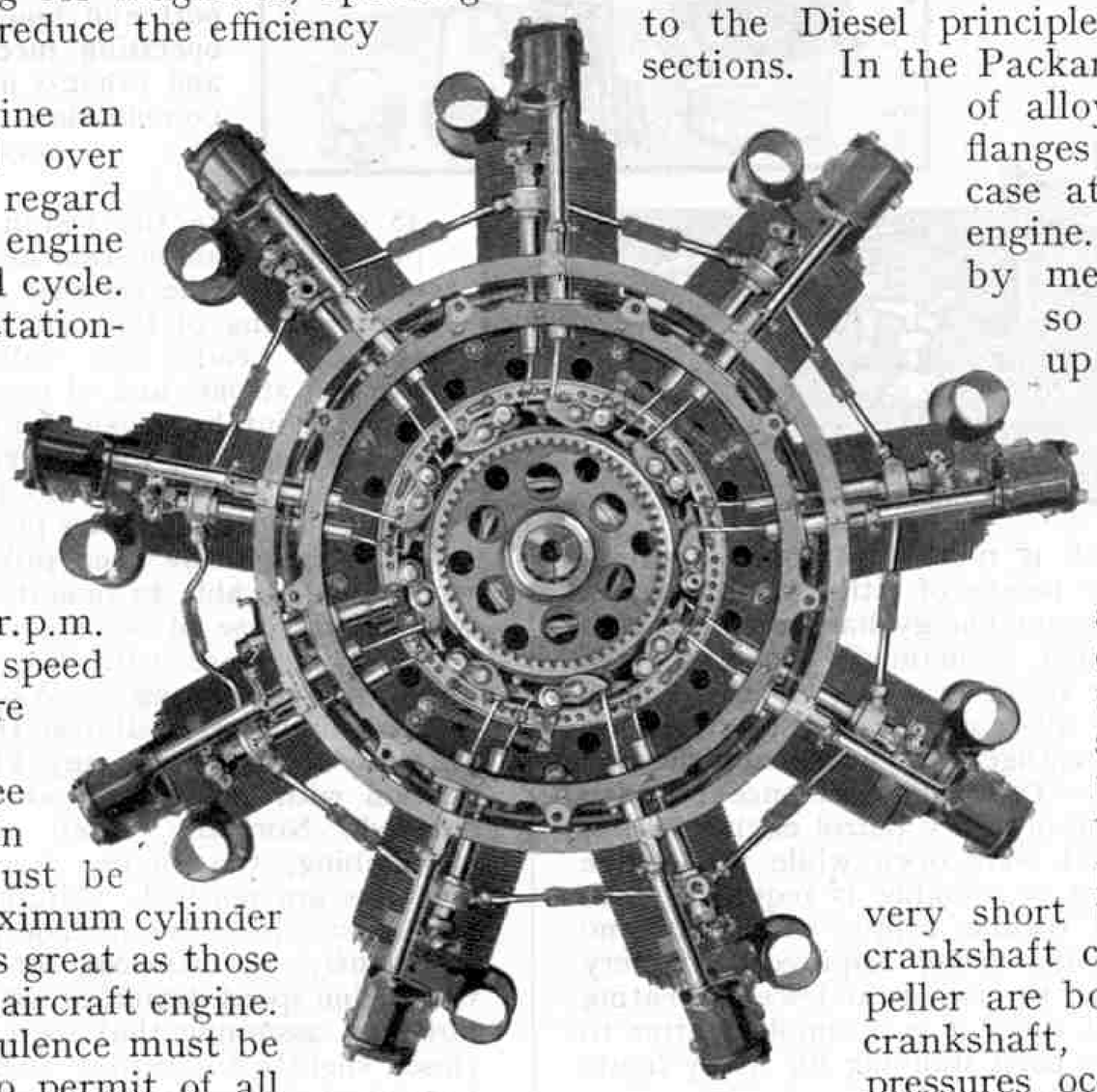


Packard Diesel engines in Ford tri-motor aeroplane.

A Diesel engine is not affected by high or low extremes of air temperature as is the petrol engine. On the one hand the Diesel engine has no tendency to detonate or pre-ignite, and on the other hand it has no characteristics comparable with the icing-up of the petrol engine carburetter in cold weather, and failure of the engine to accelerate properly after a long glide. Still another interesting fact is that the absence of electrical ignition equipment in the Diesel engine removes one of the most troublesome obstacles to extensive use of wireless in aircraft. With the petrol engine it is necessary to adopt methods of shielding for magnetos, sparking plugs, etc., and this tends to reduce the efficiency of the ignition system.

In the Packard Diesel engine an advance has been effected over previous Diesel practice in regard to extension of the range of engine speeds possible with the Diesel cycle. Previously Diesel engines in stationary and marine service have been of the slow-speed type, running between 100 and 300 r.p.m.; while even the so-called high-speed Diesels have been limited to a maximum of about 1,200 r.p.m. In the Packard Diesel this speed has been increased to more than 2,000 r.p.m.

In designing the engine three essential points were kept in view. First, the engine must be strong enough to withstand maximum cylinder pressures two or three times as great as those occurring normally in a petrol aircraft engine. Second, a high degree of turbulence must be maintained in the cylinder, to permit of all the fuel combining with all the oxygen present in the cylinder during the extremely short time allotted for combustion at high engine-speeds. Third, the fuel pumps and nozzles must be designed to operate over a much wider range of speed than had previously been found practicable in Diesel engines. Along with these three there was the further essential of light weight. Previously Diesel engines, even of the light-weight type, weighed somewhere about 25 lb. per h.p., whereas the Packard engine weighs only one-tenth as much. This great reduction in weight is essential for the success of any Diesel aircraft engine, and it has been attained by means of economies resulting from the elimination of carburetters and magnetos, and by a general simplification of design.



Rear of Packard Diesel engine showing valve and pump lifter arrangement.

The crankcase, which weighs only 34 lb., is unique in being of one-piece construction, thus dispensing with heavy flanges and bolts, and also in regard to the novel manner in which the cylinders are fastened to it. Ordinarily, in a radial air-cooled aircraft engine, each cylinder is held to the crankcase by studs screwed into the crankcase flange and projecting through the cylinder flange against which the retaining nuts seat. This arrangement involves fairly heavy crankcase construction even with a petrol engine, and if applied to the Diesel principle would require very thick sections. In the Packard engine two circular hoops of alloy steel encircle the cylinder flanges in contact with the crankcase at the front and rear of the engine. These hoops are contracted by means of strong turnbuckles, so that an initial stress is set up in the hoops that exceeds by a wide margin the operating stress resulting from the cylinder explosions.

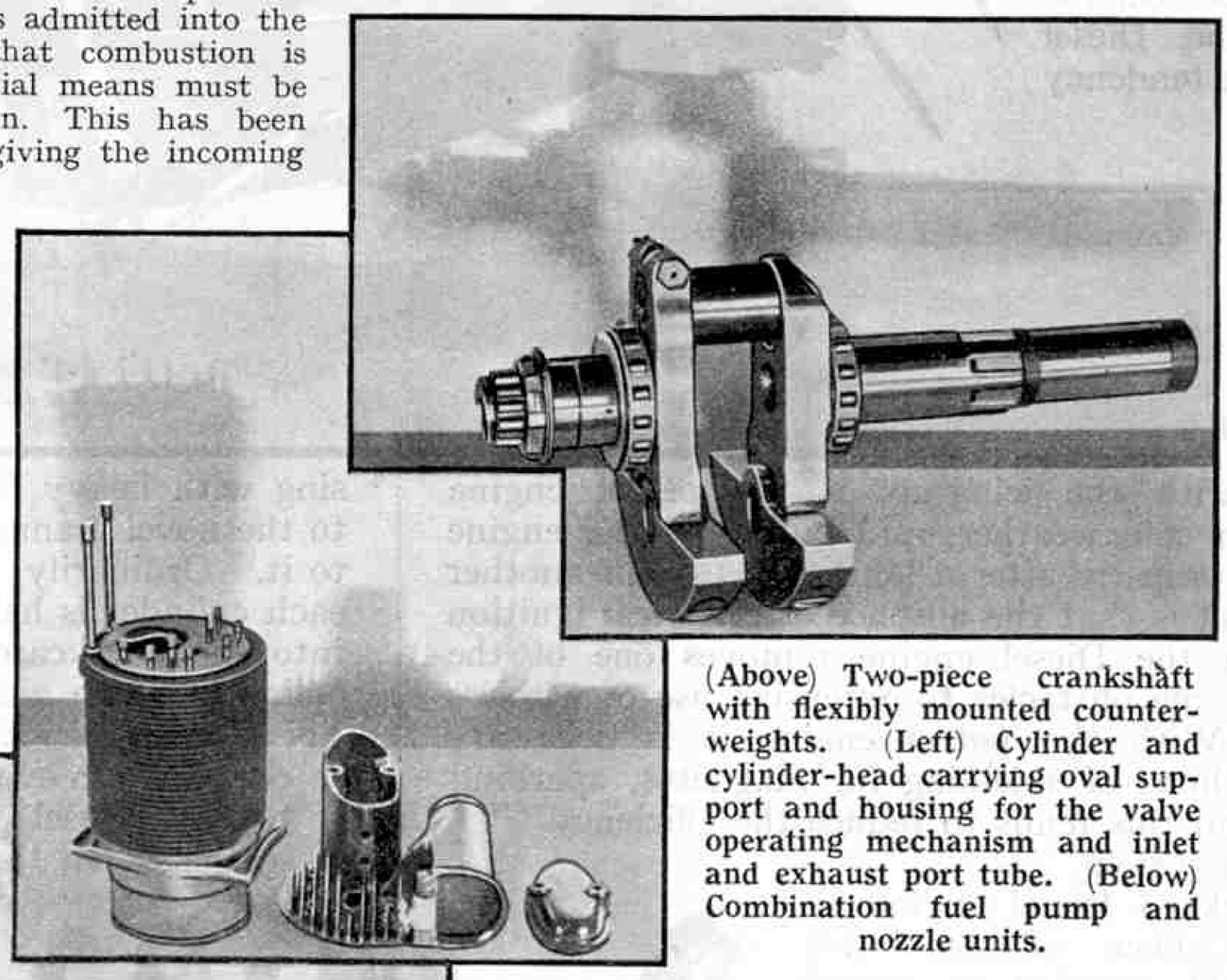
Equally interesting are the arrangements by which the crankshaft and the propeller are protected from excessively high stresses. Advantage is taken of the fact that the high explosion pressures exist only for a very short time in each cycle. The crankshaft counterweights and the propeller are both flexibly mounted on the crankshaft, so that when the high pressures occur a cushion is interposed between the crankshaft and those parts that have the maximum inertia or flywheel effect. Thus the stresses are reduced to such an extent that it is possible to use a crankshaft of a size little different from that employed in a corresponding petrol engine. This feature of the design plays a considerable part in weight reduction as compared with previous Diesels,

which have been characterised by their heavy crankshafts.

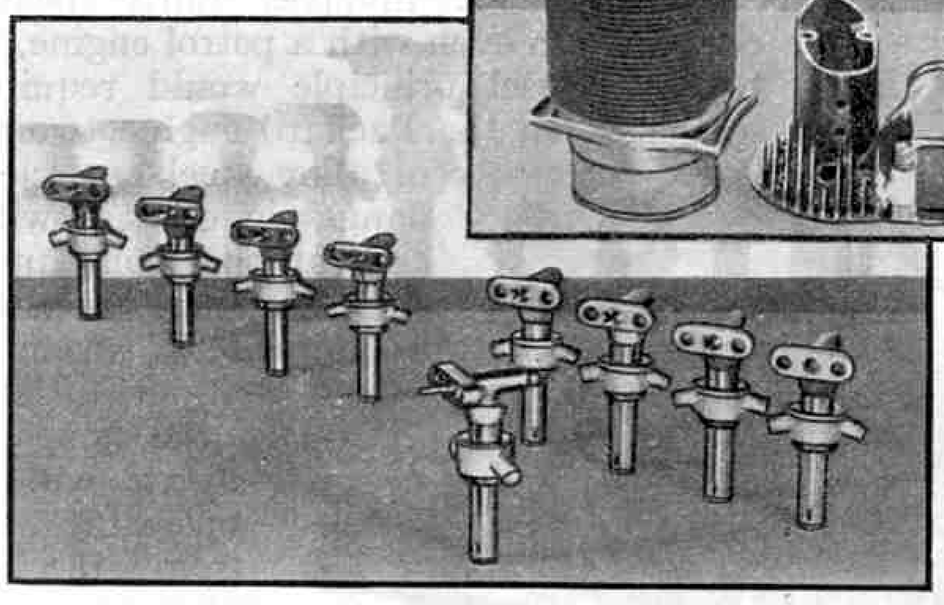
The counterweights, instead of being rigidly bolted to the crank cheeks, are pivoted on them, and are placed between powerful compression springs. Thus when the crankshaft is suddenly accelerated, the counterweights lag behind slightly, so that the peak cylinder pressure is expended before the counterweights are again solidly driven by the crankshaft. Similarly the propeller hub also is completely cushioned from any driving shocks.

The air-cooled Diesel engine presents far fewer cooling problems than does the air-cooled petrol engine. In the Packard engine the single valve arrangement has been favoured, not only on account of the general gain in simplicity and the saving in weight, but also on account of reliability, as the valve operates at a much lower temperature than the conventional exhaust valve, due to the cooling effect of the incoming air passing over the same valve.

In a petrol engine the mixing of fuel and air is carried out in the carburetter, intake manifold, rotary distributor if used, and finally in the cylinder itself during the intake and compression strokes. In the Diesel engine no fuel is admitted into the cylinder until practically the instant that combustion is desired, and in a high-speed engine special means must be provided to ensure complete combustion. This has been accomplished in the Packard engine by giving the incoming air an extremely rapid whirling motion, so that at high speed the circulation of the air in the cylinder is at a rate that permits of one revolution of the mass of air around the circumference of the cylinder-bore in the time available for combustion. A further point of importance is the securing of a finely atomised injection of the fuel, accurately controlled and timed; and this is ensured by a combination fuel pump and nozzle unit. All high-pressure tubing between pump and nozzle is eliminated; and thus are avoided troubles such as air pockets, after-dripping, and variations in timing due to the compressibility of the liquid in the piping and the elasticity of the pipe itself.



(Above) Two-piece crankshaft with flexibly mounted counterweights. (Left) Cylinder and cylinder-head carrying oval support and housing for the valve operating mechanism and inlet and exhaust port tube. (Below) Combination fuel pump and nozzle units.



The engine is started by means of the familiar type of "inertia" starter commonly used with petrol aircraft engines. This starter incorporates a small flywheel, which is rotated through a system of gearing at very high speed by means of either a hand-crank or an electric motor. When sufficient energy has been imparted to the flywheel, a dog-type clutch is manually engaged with the crankshaft, resulting in the rapid cranking of the engine for the few seconds necessary to dissipate the energy stored up in the flywheel. With this arrangement practically instant starting is possible at all times. The only difference between starting this Diesel engine and the ordinary petrol engine is that the throttle on the Diesel is held wide open while the engine is being cranked, and no priming or choking is required. The engine starts immediately on its regular supply of fuel oil, no special fuel or preparatory heating being required. At very low temperatures it is necessary to use incandescent heating elements or glow plugs, and with them it is a simple matter to start the engine even when it has been standing for many hours at a temperature of zero or below.

In order to stop the engine it is only necessary to close the throttle completely against a spring stop. This motion of the throttle mechanism restricts the stroke of the fuel pumps until the plunger barely rides higher than the pump inlet port, and consequently forces no fuel into the nozzle. It is never necessary to shut off the fuel when stopping, and there are no switches to be operated.

The lubrication system of the Packard Diesel does not differ greatly from conventional aircraft engine practice. The system, which has been simplified as much as possible, operates on the dry-sump principle, with an external oil tank of suitable capacity close to the engine.

The operation of the engine is as follows. Considering first the intake stroke, it will be found that the single valve has been open during the exhaust stroke, and remains open as the piston travels down from top dead-centre, drawing fresh air through the intake port, which is exposed to the slipstream of the propeller. Shortly after bottom dead-centre the valve closes and the air in the cylinder is compressed on the up-stroke of the piston. The air is compressed to a pressure of about 500 lb. per sq. in., and its temperature is thus raised to about 1,000 deg. F. About 45 deg. before top dead-centre the fuel pump tappet starts to rise, forcing the pump plunger upward. As soon as the plunger has passed the inlet port of the fuel pump, the fuel trapped in the pump cylinder is compressed, and forced out through the nozzle in a finely atomised spray that ignites immediately on coming in contact with the superheated air in the cylinder.

The fuel injection, which as we have seen starts about 45 deg. before top dead-centre, continues until the piston is almost at top dead-centre, thus allowing the pressure to rise in the cylinder at a comparatively slow rate until a maximum pressure of about 1,200 lb. per sq. in. at wide-open throttle is reached. When the piston passes top dead-centre, the gases expand in the cylinder until the single valve opens approximately 45 deg. before the piston reaches bottom dead-centre. The products of combustion are then forced out through the valve and through the exhaust manifold, which is connected to the rear opening of the combined inlet and exhaust port on the cylinder head. The valve remains open throughout the exhaust stroke, and of course continues open while the piston is on the intake stroke that immediately follows. The operation of the engine is exactly the same no matter how much fuel is being introduced into the cylinders, except that for very slow idling the fresh air ports are almost closed by the shutters.

It has frequently been prophesied that Diesel aircraft engines would not be able to operate in an aeroplane at great altitudes without the use of some form of preheater or supercharger, or both. Experience with the Packard Diesel proves that such ideas are quite wrong, as Waco and Stinson machines fitted with it have climbed to well over 18,000 ft. with the engine functioning normally and without any kind of special equipment. In connection with this matter an interesting condition has been discovered. Normally, when an aeroplane with a petrol engine is climbing, the engine revolutions drop somewhat as higher altitudes are reached. Although the carburetters can be leaned out by means of the altitude adjustment to bring the revolutions up slightly, nevertheless, for any fixed position of the throttle, the engine speed decreases with altitude. With the Diesel engine, however, assuming that soon after the take-off the throttle was closed slightly to cruising position, it was found that the engine, instead of decreasing in speed, actually increased as the machine climbed.

This phenomenon results in an extra degree of fuel economy under flying conditions, since the engine automatically adjusts itself to burn efficiently whatever fuel is being injected. The increase in speed with altitude under set throttled conditions is due to the fact that a pre-determined amount of fuel is injected into each cylinder, and this fuel needs for its complete combustion a certain weight of oxygen. The density of the air decreases with altitude, so that a given weight of oxygen is (*Continued on page 837*)

A Fleet of Miniature Airships

Non-rigid Vessels Employed as Air Yachts

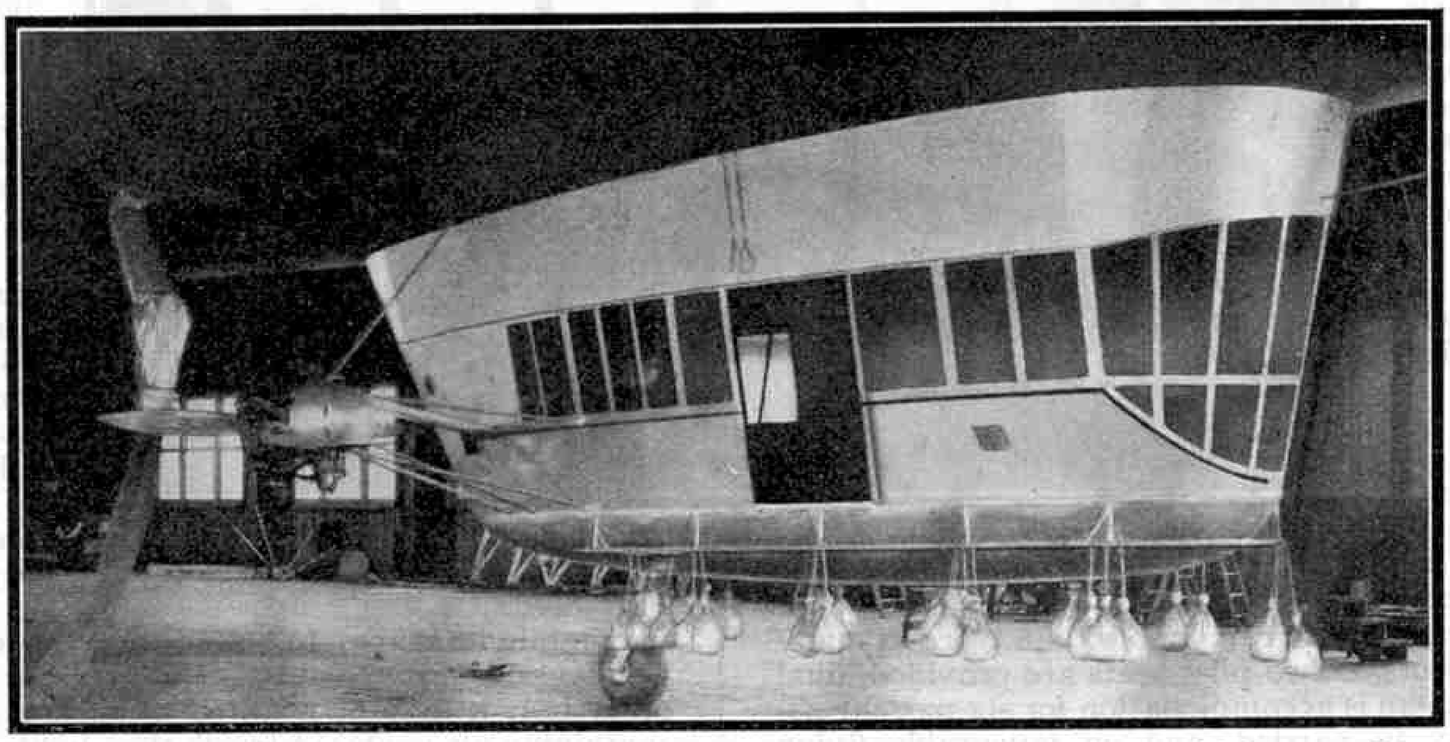
INTEREST in airships has been greatly increased by the recent exploits of lighter-than-air craft built in Great Britain and Germany. It will be remembered that last year the German vessel, the "*Graf Zeppelin*," made a successful flight round the world in less than 12 days actual flying time. The British airships, "*R100*" and "*R101*," also were completed during 1929 and trial flights of both these vessels were highly satisfactory.

The three airships named are of the rigid type and are of huge dimensions. For instance, the gas bags of the "*Graf Zeppelin*" have a total capacity of 3,500,000 c. ft. Those of the "*R100*" and "*R101*" are even larger. The former vessel has an envelope that holds 5,000,000 c. ft. of gas and alterations now being made to "*R101*" will give it a capacity of 5,500,000 c. ft.



The non-rigid airship, "*Puritan*," flying over the giant liner "*Leviathan*." For this and the other photographs illustrating the article we are indebted to the courtesy of the Goodyear Zeppelin Corporation of Akron, Ohio.

When in steady flight, or even when cruising lazily overhead, giant rigid airships such as "*R100*" and "*R101*" present an impressive spectacle, but in many respects the tiny non-rigid vessels usually called "blimps" are even more fascinating. These handy little vessels have been described as air yachts. The name is very apt, for they float freely and gracefully in the atmosphere and are not kept aloft by air pressure due to speed, as is the case with heavier-than-air craft. They are easily controlled and although not so speedy as aeroplanes, they have the compensating advantages that they are roomy and comfortable, and in addition, they may be kept hovering practically motionless over any desired place.



The gondola of the "*Defender*," the largest of the Goodyear fleet of blimps. The engines are mounted on outriggers at the sides of the car.

Unlike rigid airships, blimps have no internal skeleton to support the main envelope and to which are attached the gondolas carrying the machinery. Instead the envelope is kept in shape by the pressure of the gas in the bags. Thus blimps are constructed more like ordinary balloons. From these, of course, they differ in shape. More important differences are that their engines give them power to move through the air at comparatively high speed, and they may be controlled by means of fins and rudders.

The origin of the name by which these non-rigid airships are known is very interesting. During the war the best British vessels of this type were officially described as the "B" class of limp airships. Naturally "B"-limp ships very quickly came to be known as "Blimps," and the name thus acquired is still used.

During recent years the development of the non-rigid airships has been most marked in the United States, and in this the Goodyear Zeppelin Corporation has chiefly been concerned. The first vessel of this type to be constructed by that Corporation was launched as long ago as 1919. It was named the "*Pony Blimp*." The capacity of its envelope was only 35,000 c. ft., and hydrogen was used to give the required lift. This early vessel was used on the first regularly operated passenger airship line in America.

A successor to the "*Pony Blimp*" did not appear until 1925, when a larger airship named the "*Pilgrim*" was constructed. Three years later this was followed by the "*Puritan*," a much larger vessel equipped with more powerful engines, and during 1929 three similar airships were launched. These were the "*Volunteer*," the "*Mayflower*" and the "*Vigilant*." The extensive constructional programme for 1929 was not completed until August, when the "*Defender*," the largest non-rigid airship in the Goodyear fleet, made its first appearance. It is interesting to note that the last six of these have been given the names of famous American yachts that have taken part in international races.

With the exception of the "*Pony Blimp*" all the vessels named are in active service, and have splendid flying records to their credit. The "*Pilgrim*," the earliest of the six, now is chiefly employed in the training of airship pilots. This vessel is 110 ft. in length and 32 ft. in diameter, and has an envelope with a capacity of 54,000 c. ft. It is equipped with a single 60 h.p. Lawrence air-cooled radial engine. This gives it a maximum speed of 58 m.p.h., and it is capable of covering a distance of from 350 to 400 miles without refuelling. The engine is mounted at the rear of the gondola



The " *Vigilant* " landing at Akron. Behind the car may be seen the two scoops through which air is forced into the ballonets when necessary

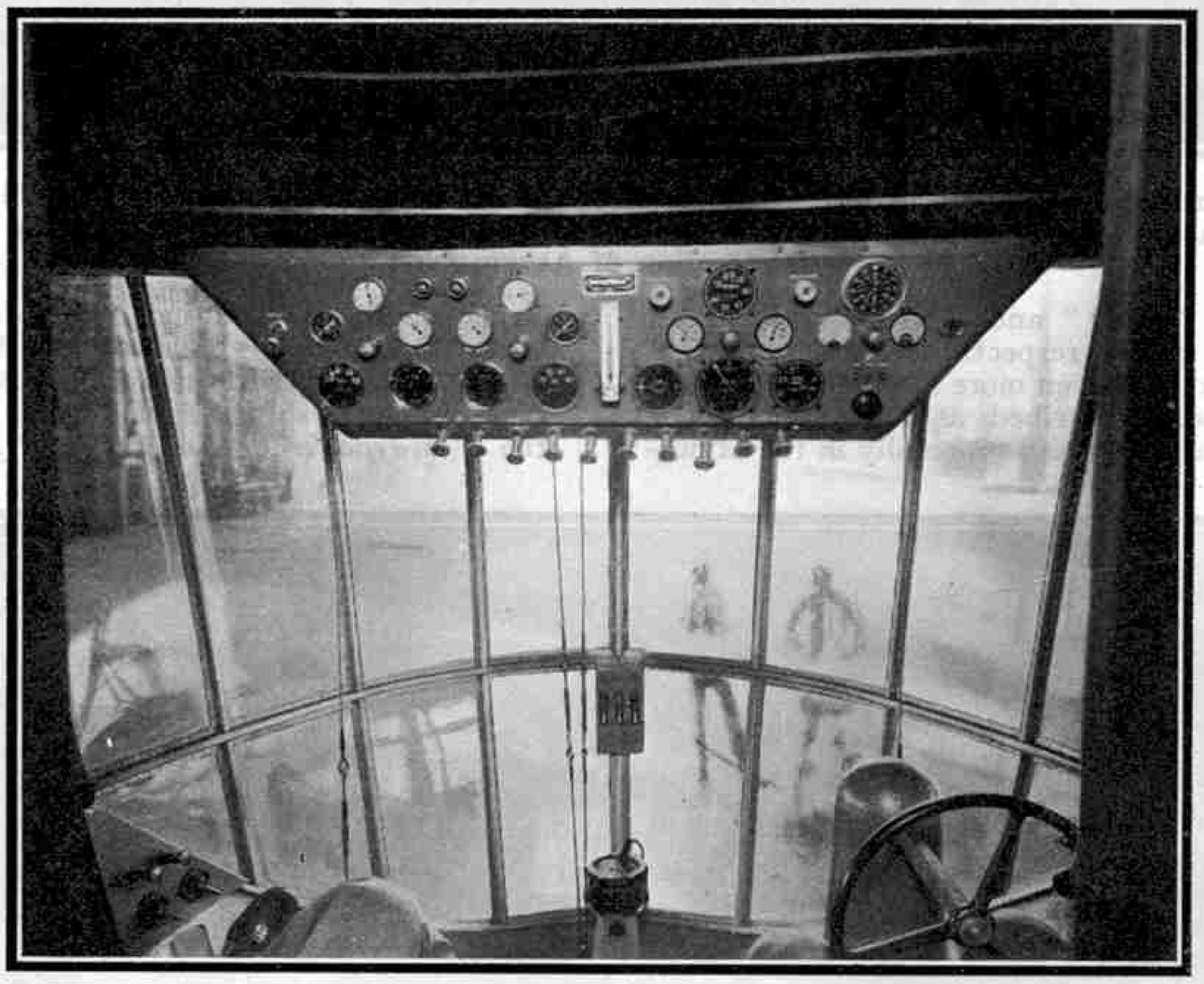
and the airscrew is of the " pusher " type.

The four vessels next constructed are larger than the " *Pilgrim.*" Each is 128 ft. in length and 37 ft. in diameter, and their envelopes have capacities of 86,000 c. ft. They also are more powerfully engined, each being equipped with two power units. The engines employed on the " *Puritan,*" the " *Volunteer* " and the " *Mayflower* " are 70 h.p. Ryan-Siemens motors. These are mounted on outriggers alongside the car, and give the airships a cruising speed of 55 miles per hour. The power units fitted to the " *Vigilant* " are two 110 h.p. radial air-cooled engines.

The airships of the " Puritan " type are constructed to carry four persons, including the pilot. All have been flown regularly since their launch. The " *Puritan* " has covered more than 50,000 miles, and each of the three vessels that were constructed in 1929 has travelled nearly 30,000 miles. The " *Puritan* " actually flew 8,000 miles in the first two months after its construction, and during this time carried more than 600 passengers, while two of the vessels have made non-stop flights of 415 miles.

The most up-to-date and best equipped non-rigid airship in the world probably is the " *Defender,*" the most recent addition to the Goodyear fleet. This is much larger than its predecessors, the capacity of its envelope being 178,000 c. ft., which is more than twice that of an airship of the " Puritan " class.

The vessel is 184 ft. in length and 43 ft. in diameter, and its greater fuel capacity gives it a cruising range of about 1,000 miles. It is fitted with two 165 h.p. Wright " Whirlwind " engines that give it a speed of 62 miles per hour. The greater lift due to its larger capacity enables the " *Defender* " to carry more than twice as many passengers as its predecessors. Two pilot seats are provided, dual control being fitted, and there is accommodation for six passengers. Two mechanics also may be carried, and on favourable flying days the craft may carry eleven people.



The pilot's view from the " cockpit " of the " *Defender,*" the world's most up-to-date blimp.

A flight in the cabin of a blimp, particularly in that of the " *Defender,*" is a luxurious experience. The cabin of the most recently constructed vessel of the fleet is upholstered in grey and blue velour and fitted with mohair finish wicker chairs. All the woodwork is of mahogany plywood and dark walnut, and is stained with a piano finish. Electric light is provided and large celluloid windows give ample vision in practically all directions.

In the cabin of the " *Defender* " the comfort of passengers is ensured by very efficient ventilation arrangements. When the airship is in motion there is a free circulation of air through the cabin, from which it is carried away through port holes at the back. The system has the advantage that the air resistance to the progress of the " Blimp " is reduced. All compartments are equipped with fire extinguishers and in emergency the entire stock of fuel may be released in a few seconds, thus diminishing the danger of disaster due to fire.

The activities of these vessels are being widely spread throughout America. After its early flights the " *Volunteer* " was dismantled and reassembled in Los Angeles. There a huge airship dock has been constructed in which to house this airship. Similar structures also have been erected in Alabama and in New England, and during last summer the " *Mayflower* " made many flights from the second of these in order to enable experimental fog, wireless and navigation work to be carried out.

In the six blimps of the Goodyear fleet the lifting power is given by helium. Unlike hydrogen, this gas is not inflammable, nor does it form an explosive mixture with air. It is as inert and harmless as the nitrogen of the air, and therefore may be used with perfect safety in balloons and airships.

The lifting power of the helium is slightly less than that of hydrogen. Of the former gas 1,000 c. ft. is sufficient to support a weight of 63 lbs., while the lift obtainable from the same quantity of hydrogen is 68 lbs. The difference is more than counterbalanced by the greater safety that follows the use of helium.

In a non-rigid airship the pressure of the gas in the bags must be kept constant in order that the envelope may retain its shape. In hot weather the helium in the envelope of a Goodyear blimp expands. The pressure is thus increased, and in order that it may be restored to normal a smaller bag or ballonet containing air is placed inside the airship. This is in communication with the atmosphere through a valve that opens when the pressure exceeds a certain figure. Thus the effect of expansion of the helium is simply to drive out air from the ballonet, and the original pressure is restored without loss of the very valuable helium.

In cold weather and at nights the fall in temperature causes the gas to contract and the pressure in the envelope then falls. If means of forcing more air into the ballonet were not adopted the gas bag would lose its shape. When in flight the additional air required is introduced by opening scoops placed behind the propellers, and

through these the slipstream is directed into the ballonet until the required pressure is attained. If the pressure in the gas bag of one of the airships falls when it is in its hangar, more air is introduced by using an ordinary vacuum cleaner as a blower.

One of the great advantages of the use in this manner of air ballonets is that the rare and costly gas helium is not wasted, the only loss that takes place being due to slow diffusion through the material of the gas bags. This amounts to from one to three per cent. in a month of ordinary service. Practically the only occasion in the history of the Goodyear fleet when it became necessary to allow helium to escape was on an extremely hot day during 1929. The temperature of the gas in one of the blimps flying at Indianopolis then reached 115°F. The helium expanded beyond the capacity of the bag and it was necessary to release some of it in order to prevent the envelope from being ripped.



The "*Defender*" ready to be "walked" into its hangar. A comparatively small number of men handle the Goodyear blimps with ease.

Blimps may be used for many purposes. They are particularly suitable for surveying and other photographic work because of their ability to hover for any length of time in one position. In order to enable this to be done the engine is run at a speed sufficient to overcome drifting due to wind.

The ease with which the airships may be assembled and handled by a small crew also makes them useful for such purposes as scouting for whales and schools of fish. In time of war they may be employed for scouting work generally and are particularly valuable for directing artillery fire and in the detection of submarines and mines. It is an interesting fact that an underwater vessel is readily seen from a height, provided it is not cruising at too great a depth.

Valuable as these airships are for the purposes already mentioned, there is little doubt that they will find their greatest use in carrying passengers and mail. The commercial airlines of the future probably will be worked by large airships. These will fly from continent to continent, and carry tons of mail and light goods in addition to thousands of passengers. It is the belief of the Goodyear Corporation in the great part to be played in the future by the airship that has led them to construct the six blimps constituting their present fleet, and one of the chief purposes of these miniature airships is to help to familiarise the public with the new form of transportation.

In the work of demonstrating the capacity of lighter-than-air craft the Goodyear blimps are proving very successful. Last year the six vessels carried 6,000 passengers over a total distance of more than 132,000 miles. In making this record the airships spent 3,500 hours in the air, and made more than 4,000 landings. Every flight was carried out in perfect safety and not a single accident marred the wonderful performances of the airships of the fleet.

Although high winds and unfavourable weather conditions generally may prevent the ascent of a non-rigid airship, it does not necessarily follow that a blimp is incapable of battling with a storm. During one of her flights the "*Puritan*" ran into adverse weather conditions. The pilot could have avoided trouble but deliberately pushed onward to his destination. The storm became more violent and at times the gusts of wind reached a speed of more than 50 m.p.h., with the result that the airship was carried backward in spite of the fact that its engines were exerting their full power. For an hour the vessel was tossed in all directions by powerful wind currents, but the pilot checked every movement within 200 or 300 ft. by skilful manipulation of the broad fins fitted to the tail of the airship.

When the storm passed the "*Puritan*" had been driven back two miles but had sustained no damage from the rough treatment received. The strange battle in the sky was watched by a quarter of a million people, who required no further proof of the staunchness of the blimp.

Adventures similar to that of the "*Puritan*" are comparatively rare, but an even more remarkable experience that befell the "*Pilgrim*" showed the reliability of the blimps under quite other circumstances. On one occasion the motor of this airship suddenly stopped. On examination the pilot discovered that vibration had loosened a connection between the petrol tank and the motor, with the result that the entire stock of fuel had fallen out.

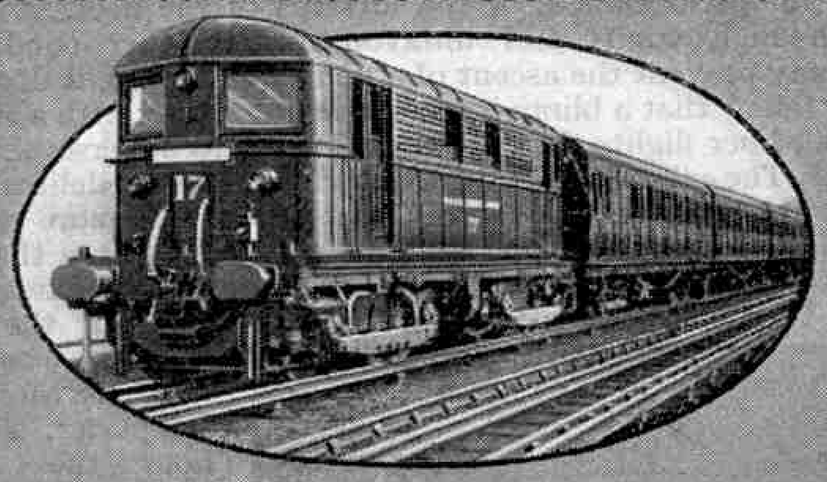


Small non-rigid airships are readily controlled and may be kept stationary in the air. In the above photograph the "*Pony Blimp*" is shown "anchored" near the surface of a lake in order to allow the occupants of its tiny gondola to fish.

The accident reduced the "Blimp" to the condition of an ordinary balloon. The airship was never in danger, however. The pilot merely allowed it to drift until a suitable landing place was reached, when he valved out a little helium in order to commence the descent. On approaching the ground he lowered his drag rope and this was seized by farmers working nearby, who pulled the airship to the ground. The pilot then borrowed more petrol and continued his flight.

The Goodyear Corporation are not only building very efficient blimps, but are training pilots for them. For this purpose they have opened a training school at their headquarters in Akron. Those who wish to enter it in order to qualify as pilots must first pass a stringent medical examination. The actual course begins with attendance at classes in which the theory of airships is fully explained. Then follows practical training during six ascents made in free balloons. In these ascents the pupil is accompanied by an instructor, and on the completion of the last the pupil is expected to be sufficiently well acquainted with his duties to undertake a seventh alone.

If the solo flight is satisfactorily carried out a balloonist's license is awarded to the pupil and he is then (*Continued on page 808*)



A METROPOLITAN TRAIN

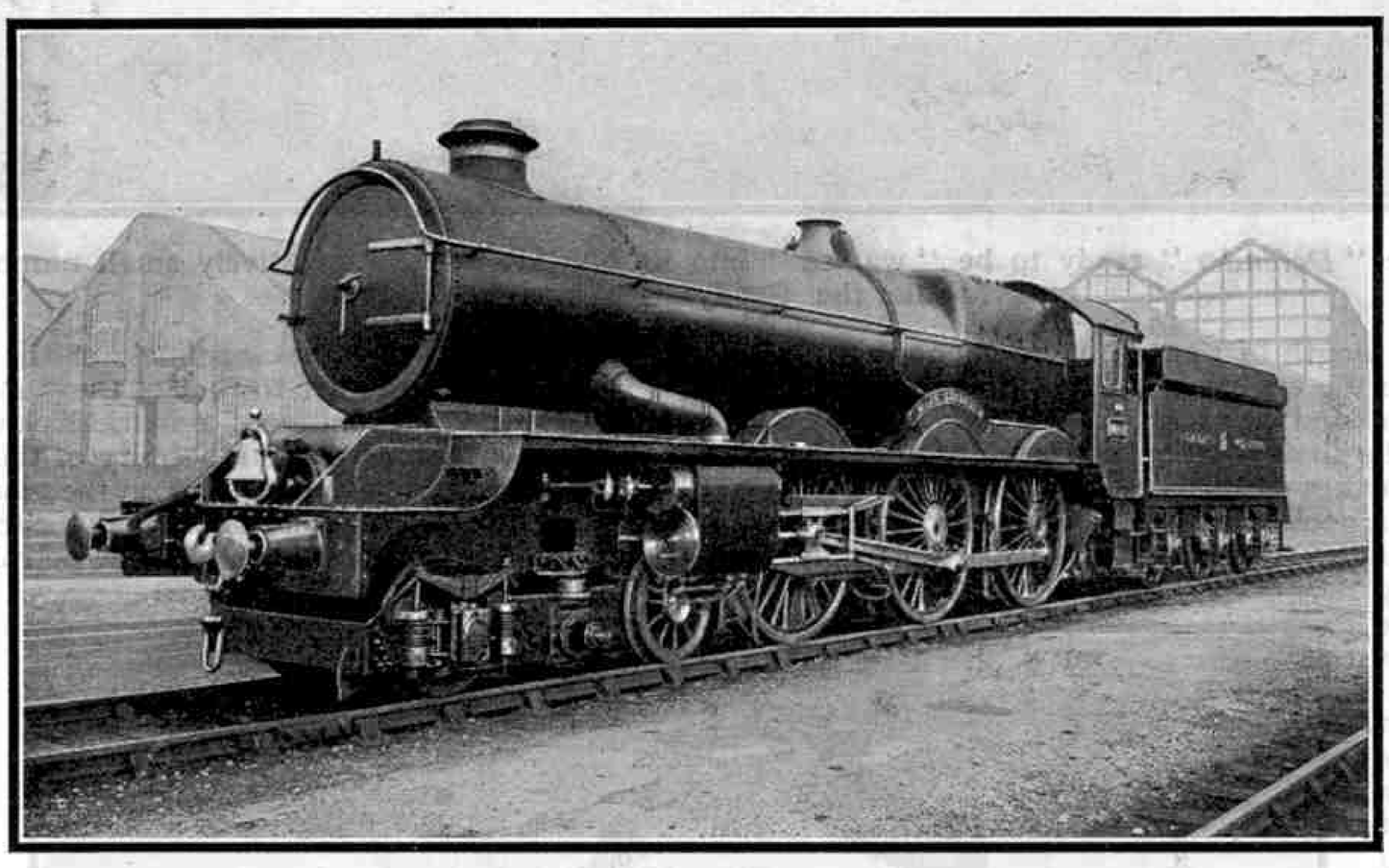
RAILWAY NEWS

L.N.E.R. "Pacifics" Work Through to Aberdeen

The new series of 4–6–0 express engines of the "Sandringham" class for the G.E. section are now being turned out from the works at Darlington. The first to be put into service was No. 2810, *"Honingham Hall."* Three more 2–6–0 mixed-traffic engines have also been completed at Darlington. They are numbered 2764-6.

After tests had been made in June last, it was decided that locomotives of the "Pacific" type should work regularly between Edinburgh and Aberdeen. As a result, these engines are now working the heaviest express passenger trains over the whole of the East Coast route between London and Aberdeen, a distance of 523.7 miles.

Before the introduction of the "Pacific" engines, the expresses on the Edinburgh and Aberdeen section were hauled chiefly by the North British "Atlantic" engines of the C11 class. Often the loads were too heavy for these engines to tackle singlehanded and an assistant engine was required. A considerable amount of this double heading will be avoided now that "Pacifics" are available. It has been necessary to fit the locomotives of this class employed on the route with tablet-exchanging apparatus for the single-line workings between Inverkeilor and Kinnaber Junction. The engines so fitted include:—No. 2565, *"Merry Hampton,"* No. 2566, *"Ladas,"* and No. 2567, *"Sir Visto."* This apparatus is commonly fitted to locomotives of the Highland section of the L.M.S., on which there are many stretches of single track.



G.W.R. locomotive No. 6000 "King George V," the first of the "King" class, which are the most powerful locomotives in the British Isles. In 1927 this engine took part in the Centenary Celebrations of the Baltimore and Ohio Railroad in America. The most recently-completed engine of the same class, No. 6029, "King Stephen," was on view at the Railway Exhibition held last month at Liverpool and described on page 762.

The Corris Railway

The Corris Railway, which runs along the beautiful Welsh valley between Machynlleth and Ratgoed quarry, has been acquired by the Great Western Railway and became an integral part of the G.W.R. system on 4th August. The track, which is single throughout, has a gauge of 2 ft. 3 in. and a total length of 8 miles 40 chains. There are seven stations. Traffic on the line is carried by eight coaching and 29 goods vehicles.

Safety on British Railways

The Ministry of Transport Returns of Railway Accidents which were published recently show that only three passengers lost their lives in accidents to trains on the British railways during the year 1929—fewer people than are killed on the streets of London every day. The number of passenger journeys made on the railways in that year was 1,702,000,000.

The Great Western Railway Magazine very fitly points out that this remarkable degree of safety has not been attained without continuous care and supervision, and the provision, at huge cost, of electrical and mechanical devices designed to aid the human element in railway operation. Every engine driver is a skilled man of many years' experience and subject to stringent tests of eyesight and general fitness; the signalman who controls the passage of trains is also a skilled man of long service, who is safeguarded from error by an intricate system of interlocking and other devices.

On the railways of no other country are such elaborate precautions taken to ensure the safety of passengers.

The Colour of Railway Bridges

The L.M.S. are experimenting on six bridges in Derbyshire in an endeavour to discover what colour will harmonise with the surrounding landscape. Several tones of green having first been tried, the bridges have now been painted a "battleship grey."

The Atlantic Coast Express

A correspondent who has travelled recently from London to Exeter and back by the Southern Railway's *"Atlantic Coast Express"* records some excellent running. Each of the four engines concerned improved distinctly upon the schedule time. On the down journey, the load consisted of 12 coaches, weighing, with passengers and luggage, fully 410 tons. The engine from Waterloo to Salisbury was No. 862 *"Lord Collingwood,"* of the "Lord Nelson" class, and at all points it performed its task with evident ease. Woking, 24.4 miles out, was passed in 27 min. 45 sec.; at Basingstoke 2 min. had been gained on schedule and the 47.8 miles covered in 52 min. Between Oakley and Overton there was a long relaying slack, but in spite of this delay Salisbury was reached 1 min. 55 sec. early.

For the difficult section from Salisbury to Exeter, with its heavy grades and sharp timing, the engine was No. 768 *"Sir Balin"* of the "King Arthur" class. This engine behaved like most of its class by attaining the very high speed of 85 m.p.h. or more with great facility on the downhill sections and also tackled the steeply rising grades in such a business-like manner that the 88 miles from Salisbury were covered in 99 min. and Exeter was reached 1 min. early.

On the return journey, the load was 10 coaches and the total weight about 335 tons. Engine No. 449, *"Sir Torre,"* took the train from Exeter to Salisbury and, in spite of one signal slack, covered the distance in 96 min. 35 sec. At Salisbury, another "King Arthur"—No. 775, *"Sir Agravaine"*—took up the running. The 40½ miles from Basingstoke to Wimbledon were run off in 35 min. 35 sec. Adverse signals brought the train to a stand just outside Waterloo 88 min. after leaving Salisbury.

These runs may be taken as typical of the everyday work on the *"Atlantic Coast Express."* The engines employed on this famous train are more than equal to the exacting demands made upon them. They are economical in operation and popular with drivers.

L.M.S.R. Locomotive News

Further engines of the 4–6–0 "Royal Scot" class have been completed at Derby. They are numbered 6152-62.

Crewe works have continued to turn out engines of the 2–6–0 mixed-traffic type, the latest being Nos. 13190 to 13203.

Engines No. 5971, "*Croxteth*" and No. 5977, of the "Claughton" class, are being rebuilt at Derby as 3-cylinder simples.

"Claughtons" 5905, "*Lord Rathmore*," 5912, "*Lord Faber*," and 5976 have been transferred recently to the Midland division. They had previously been adapted to the Northern division loading gauge. Most of the 2–8–0 goods engines that were built for the Somerset and Dorset Railway have been transferred to the Midland division, where they are working coal trains between Cricklewood and Toton.

During recent months much interest has been aroused by the fact that the famous old Caledonian "single" express engine, formerly numbered 123 but now carrying the L.M.S. number 14010, has been performing regular work again. It is now stationed at Perth shed and works trains —both fast and stopping—between that city and Dundee. Four return trips are its usual day's work. Built by Neilson & Co. in 1886, and shown at the Edinburgh Exhibition, this locomotive was afterwards acquired by the Caledonian Railway and achieved fame by its notable runs during the "Railway Race" of 1888. Of late years it has done occasional duty in drawing the directors' saloon in the Scottish division of the L.M.S. Its days of active service must now be well-nigh ended, but it is much to be hoped that this famous "single" will be saved from the scrap-heap and will find a fitting resting place in the Railway Museum or elsewhere.

"*Call Boy*" Keeps Going

The L.N.E.R. Pacific locomotive No. 2795, "*Call Boy*," has done twenty-eight days' continuous running between Edinburgh (Waverley) and London (King's Cross), 392¼ miles. On twenty-four weekdays it hauled the "*Flying Scotsman*" non-stop between London and Edinburgh and on the four Sundays a day express which stops intermediately. This engine therefore covered 11,000 miles in four weeks, of which 9,400 miles were made up of the world's record daily non-stop run. The mileage covered by modern locomotives is frequently surprising. There is no doubt that engines are extremely hard-worked, many being double-crewed regularly.

The World's Fastest Trains

Remarkable accelerations have been made recently in the running of certain express trains on the Canadian National Railways, with the result that that Company now claims to run the fastest trains in the world.

The "*International Limited*" of the Canadian National Railways covers the 334 miles between Montreal and Toronto in 360 mins. including stops. It is claimed that for this distance it is the fastest train in the world. This famous train has been in daily operation for thirty years.

Coming down to shorter distances, it is further claimed that on the C.N.R. there are several speedier runs than that of the celebrated "*Cheltenham Flyer*," on the Great Western Railway, which covers the 77¼ miles from Swindon to Paddington in 70 minutes—an average of 66.3 m.p.h. For example, between Brockville and Coteau Train No. 6 makes the 87.7 miles run in 78 minutes at an average speed of 67.5 m.p.h., and it covers the distance of 76 miles between Prescott and Coteau in 66 minutes, its average speed thus being 69 m.p.h. Train No. 15 makes the run of 87.7 miles between Coteau and Brockville in 80 minutes at an average speed of 65.8 m.p.h., and only takes 67 minutes to travel between Coteau and Prescott, its speed over this section averaging 68 m.p.h.

These runs are the more remarkable when it is remembered that the train loads are about 1,000 American tons—a weight equivalent to 893 British tons—and that the engines have driving wheels only six feet in diameter. Evidently the Canadian National Railways are alive to the fact that the modern world demands speed in travel as well as comfort. Their efforts in these directions have earned them a great reputation among the world's most considerable railways. Our British railways must look to their laurels.



An L.M.S. breakdown crane assists in placing in position the chimney of the "North Star," the famous broad gauge locomotive of the G.W.R. built in 1837, in preparation for the exhibition held during the recent Railway Centenary Celebrations at Liverpool.

Beardmore-Caprotti Valve Gear for the G.S.R. (I.)

Two of the standard 4–6–0 express engines on the Great Southern Railway (Ireland) have been rebuilt and fitted with Beardmore-Caprotti valve gear. The locomotives have driving wheels 6 ft. 7 in. in diameter, and two outside cylinders 19½ in. diameter by 28 in. stroke.

A Great Western Experiment

An interesting device has been tried for several months past on the G.W.R. engine No. 4076, "*Carmarthen Castle*." Readers of the "*M.M.*" will have noticed that when a driver releases the vacuum brake before starting his train, it sometimes happens that a quantity of water —which is usually very dirty— issues out of the chimney with unpleasant results for any persons who may be standing near. This water is caused by the steam that has condensed within the ejector pipe while the engine has been standing. When steam is applied to "blow up" the brake, this water passes through the long ejector pipe on the side of the boiler, turns through an elbow on the smoke-box into another pipe and is then carried up the chimney. On "*Carmarthen Castle*" the elbow on the smoke-box has been altered, and inside the smoke-box a "separator" has been fitted which arrests the water and diverts it into a small pipe from which it is discharged alongside the cylinder cock pipes, quite clear of the platform and any persons who may be standing there. The results of this experiment have been very satisfactory.

New Coaches for the "Southern"

Twenty third-class coaches of a new type are being constructed at the Eastleigh Works of the Southern Railway. The design is a happy combination of a dining car and Pullman coach. The new coaches are 59 ft. in length and 9 ft. in width, and their outward appearance matches that of the latest ordinary passenger stock. Entrance is by means of a vestibule at either end, and a central corridor runs through each coach.

Within each coach are two saloons, one seating sixteen passengers and the other forty passengers, this larger saloon being subdivided by an archway. The seats are arranged in pairs facing each other and are provided with loose cushions upholstered in red, black and yellow velvet. Fittings are provided for the erection of portable tables between the seats. The windows are of the frameless type and are self-balanced, thus eliminating any rattle.



These pages are reserved for articles from our readers. Contributions not exceeding 500 words in length are invited on any subject of general interest. These should be written neatly on one side of the paper only, and they may be accompanied by photographs or sketches for use as illustrations. Articles that are published will be paid for at our usual rates. Statements contained in articles submitted for these pages are accepted as being sent in good faith, but the Editor takes no responsibility for their accuracy.

A Covered Wagon Journey in Canada

Recently I had the pleasure of making a tour in a covered wagon. This was modelled on the famous wagons used by the pioneers who, in the middle of last century, made their way across the prairie regions of the United States and through the Rocky Mountains to the gold fields of California or the newly founded settlements in Oregon. Our wagon was drawn by two horses and provided a comfortable if leisurely means of travel that enabled us to enjoy to the full the trip through eastern Alberta.





(Above) The covered wagon in which our reader, J. D. Siddons, Wainwright, Alberta, made the interesting tour described on this page. (Right) A halt for the night in the woods near Frog Lake.

On leaving home we travelled eastward along the line of the railway before striking northward to the North Saskatchewan River. The crossing of the river was interesting and just a little exciting, for the banks sloped at a very steep angle, and after negotiating the descent, the wagon had to be carefully manœuvred on the the ferry boat in which it was carried to the opposite side.

The crossing of the Saskatchewan River was made toward the end of a day's journey of 28 miles and after travelling three more miles we camped near a farmhouse. There we stayed for two or three days, spending most of our time fishing in a pretty lake surrounded by tall spruce. This was well stocked with pike, perch, and jackfish that gave us good sport.

One day we made a very interesting excursion to Frog Lake, about five miles distant from our camping ground. The shore of the lake was the site of a famous trading post of the Hudson's Bay Company. This was the scene of a massacre during the Northwest Rebellion of 1885. The Indians of the prairie provinces had become dissatisfied and finally broke into open revolt. Among those who took up arms were the Crees, and under the leadership of their chief, Big Bear, members of this tribe attacked the trading settlement. A hideous massacre followed, only one of the 13 inhabitants escaping. The graves of the twelve victims may be seen in an enclosure that also contains a cairn erected as a memorial. We made a thorough examination of the site of the settlement and were greatly interested in the cellars of the old wooden buildings. Into these we descended and cut sticks as souvenirs.

The Indians who attacked Frog Lake later threatened Fort Pitt, a larger settlement some distance away, and a massacre there was only averted by Mr. McLean, the Hudson Bay Company's officer in charge, who had great influence with the assailants. He smoked the calumet with them, and after a long conference the police in the settlement were allowed to depart down the river amid floating ice, while the others surrendered to the Indians. They remained in the hands of their captors for 62 days and were only released when the Indians were attacked by superior forces and asked Mr. McLean to intercede for them.

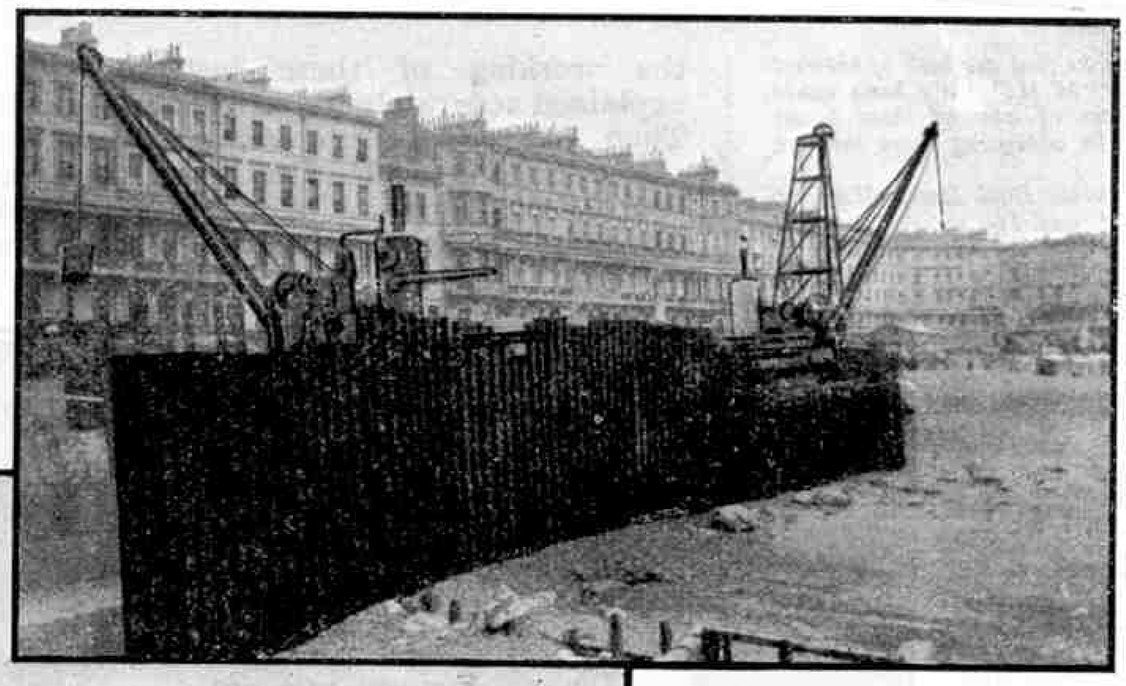
On the day following our visit to the Frog Lake settlement we commenced our homeward journey and completed an interesting holiday by a leisurely march back to Ranfurly.

J. D. SIDDONS (Wainwright, Alberta).

A Sea Wall Built of Steel Piles

The method of construction usually adopted for the sea-walls of our seaside resorts provides a hard and solid exterior, but the interior is comparatively soft. The result is that when the sea succeeds in making a breach in the outer surface, it promptly attacks the softer material behind and makes the gaps and cavities that most of us have seen on promenades after a great storm. An example of a more modern method of construction that produces a much stronger wall is to be seen at Hastings, where considerable extension of the promenade has become necessary.

Massive steel piles are driven into the beach in long lines, the space between each line being filled by concrete blocks. Each pile has flanges and grooves along its sides, which engage with those of the next pile, resulting in an interlocked construction. In addition the girders are welded together by the use of oxy-acetylene torches, and thus they form solid steel walls of immense strength. The structure will be completed by facing the outer steel wall with concrete blocks. The work is expected to be completed early next summer, and it is believed that the wall will be capable of withstanding for a long period the furious onslaughts of the sea to which Hastings is subject.



(Above) A section of the steel piling that forms the basis of the new sea wall at Hastings. (Left) View of the pile-driving in progress during building operations.

An interesting minor feature is a large underground parking station for cars, that is to be built in a portion of the promenade extension. Cars will enter this station by means of inclines leading down from the roadway above.

B. Murphy (St. Leonards-on-Sea).

"R100" Arrives at Montreal

When I learned on which day "*R100*" was expected to arrive at Montreal, I decided that if possible I should be there when she was moored to the mast at St. Hubert Airport. The result of this determination was that, with thousands of others, I waited at the Airport until 2.30 in the morning. A sharp rainstorm made things very uncomfortable, and the repeated disappointment of our hopes that the airship was about to arrive worried us. Finally our patience was rewarded. A messenger from the Press hangers called out "Here she is! Here she is!" and on turning my eyes toward Montreal I distinguished a giant cigar-shaped object outlined against the dull grey clouds.

The airship was flying low and making good speed. Very soon I was able to distinguish the winking lights in the saloons and the navigation compartment, and also to hear the steady drone of her engines. As the vessel drifted overhead, her gigantic bulk casting a shadow over the whole field, the beam of a powerful searchlight was directed upward and run along her glittering side until the great black letters "*R100*" were clearly illuminated. A terrific cheer then broke out from the huge crowd that had so long awaited her arrival.

It was too dark to enable the vessel to be moored and for a time she remained in the air, travelling slowly northward. At sunrise she returned, circled the lofty mooring mast, and with her engines idling, then nosed in toward the joint at the masthead. The mooring cables were dropped and attached by the men of the landing crew to guide ropes on the mast. Slowly the giant responded to the steady tug of the cables, and when the nose of the vessel touched the mooring joint, the crowd again cheered and all rushed towards the base of the mast in order to see the members of the crew come down to earth.

G. Bevan (Montreal).

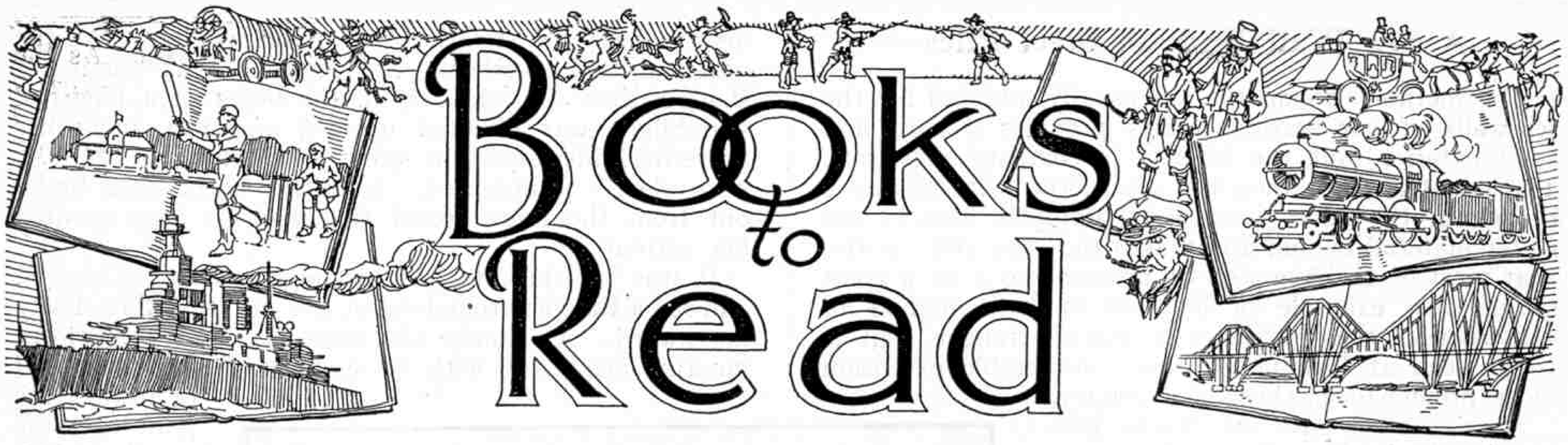
A Total Eclipse in the Malay States

I was one of thousands who were greatly interested in the total eclipse of the sun visible on 9th May last from the Federated Malay States, in which I live. I provided myself with a piece of smoked glass through which to gaze at the sun without receiving injury from its powerful glare, and for two hours gazed upward almost continually. I was rewarded with a stiff neck, but the pain was forgotten in the thrill of the wonderful sight.

The climax came when the sun was completely obscured. For nearly five minutes there was no more light than may be seen on a very fine moonlit night. During that time, in the sky could be seen the black disc of the moon surrounded by the pearly halo of the corona, while on its edges the crimson prominences were visible. These appeared to be very tiny, but I knew that in reality they were huge masses of glowing gas, many times the size of the earth, that were shot up from the surface of the sun with incredible speed.

As the shadow crept over the face of the sun the Chinese inhabitants of the city fired crackers and banged on drums and empty jars in order to frighten away the dragon that they believed to be swallowing the sun. The pandemonium reached its height at the moment when totality began. A few minutes later the sun reappeared, of course, and it would be interesting to know how many of the Chinese who helped to make the noise believed that their efforts caused the dragon to disgorge its fiery meal.

Yong Yoon Choi (Seremban).



On these pages we review books that are both of interest and of use to readers of the "M.M." We have made arrangements to supply copies of any of these books where readers find difficulty in obtaining them through the usual channels.

Orders should be addressed to the Book Dept., Meccano Limited, Old Swan, Liverpool, and 1/– should be added to the published price of the book to cover the cost of postage. The balance remaining will be refunded when the book is sent, as postages on different books vary according to the weight and destination.

"Television To-day and To-morrow"

S. A. MOSELEY and H. J. B. CHAPPLE, B.Sc., A.M.I.E.E.
(Sir Isaac Pitman & Sons Ltd. 7/6 net)

Television is a subject that is rapidly increasing in practical importance. Regular transmissions of studio scenes are now included in the programmes of the British Broadcasting Corporation, and although these are described as experimental they are sufficiently successful to suggest that the day may be not far distant when television will be as important a feature of daily life as broadcasting is to-day. At present the scenes "televised" are enacted within a few feet of the transmitter, but there is little doubt that ultimately we shall be able to see events taking place hundreds or even thousands of miles away, just as easily as we now hear by means of wireless the sounds that accompany such events.

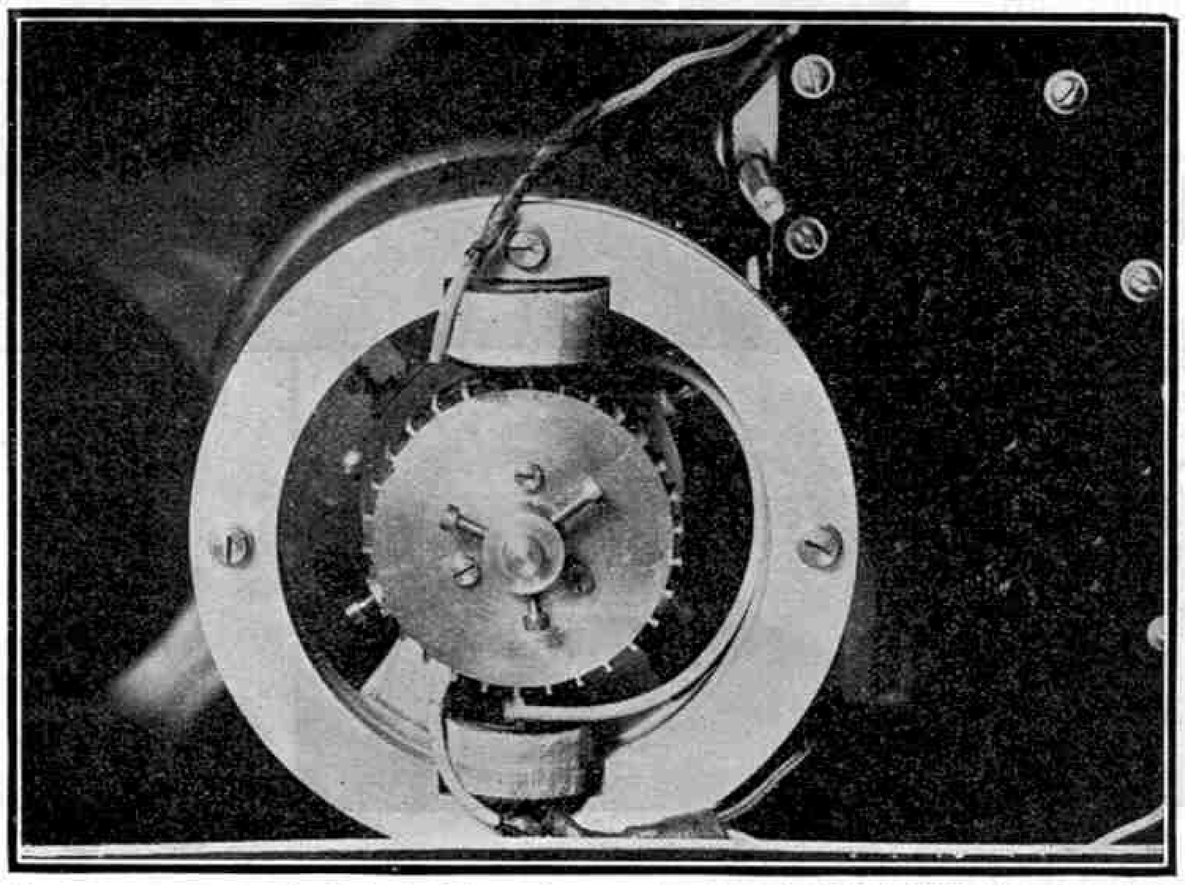
Readers of the "*M.M.*" are all interested in the fascinating story of scientific progress, and they will find in this book a clear account of how the marvel of television is performed. The various descriptions are interesting to read and easy to understand even by those whose technical knowledge is very limited. Almost the whole of the volume is taken up with the work of Mr. J. L. Baird, the progress made by inventors in other countries being only referred to briefly in a final chapter. This is natural, for Mr. Baird is not only British, but he was the first to demonstrate true television. Of all pioneers of television he undoubtedly has been the most successful in developing his inventions to the stage of being commercially practicable schemes. The book is written with Mr. Baird's authorisation and approval, and he contributes to it a foreword in which he makes the interesting statement that he sees no barrier in the way of the advancement of television to a perfection rivalling that of the cinematograph.

Commencing with a short history of television in this country, the authors pass on to give details of the Baird television transmitter and "*Televisor*" receiver, and the working of these instruments is explained accurately but in simple language. Then follows an interesting account of the manner in which Mr. Baird has overcome one of the main difficulties of practical television, that of synchronising, or keeping in step, the motors that are employed in the transmitting and receiving sections of the apparatus. This is absolutely necessary if clear and undistorted images are to be produced, and the authors point out that it was the difficulty of devising a simple means of ensuring synchronisation that prevented television from becoming a commercial reality much earlier. Mr. Baird has invented two distinct synchronising methods. The more recent of these is remarkably simple, and the mechanism employed and the ingenious manner in which it is brought into action by means of a portion of the signal sent out from the transmitting station are clearly described.

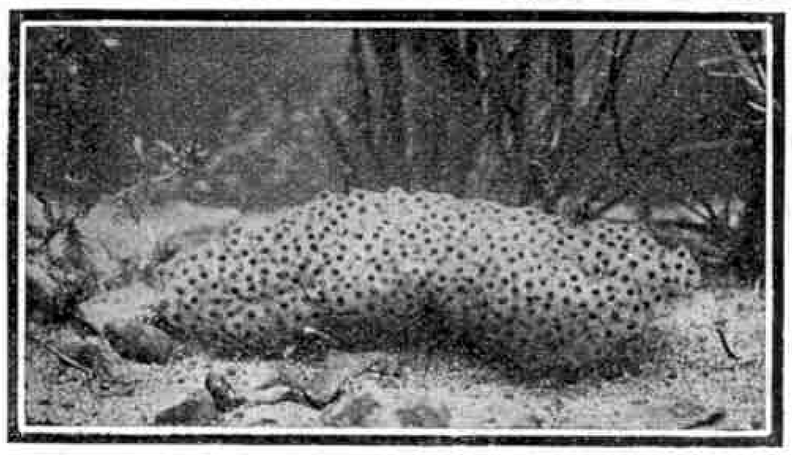
Next follow chapters on practical points of special interest to all those whose ambition it is to possess a television receiver. The authors give excellent advice on the best forms of wireless receivers and amplifiers to use for television purposes, and describe the operation of the "*Televisor.*"

Finally there are interesting chapters on some of the more recent and sensational developments of television that have been made by Mr. Baird. Readers of the "*M.M.*" will be familiar with some of these from the articles on "*Television*" that appeared in the issues for July, August and October of last year. We may recall, however, that Mr. Baird has invented "phonovision," a method of storing pictures on gramophone records so that they may be reproduced at any time on the screen of a "*Televisor*"; and that he has developed his apparatus to such a state of perfection that objects and figures may be televised in ordinary daylight, thus avoiding the use of the intense glaring lights that were used in the early days of television. He has even succeeded, by a process that he calls "noctovision," in transmitting and receiving images in complete darkness, making use for this purpose of the invisible infra-red rays. Accounts are given of all these interesting inventions, and also of Mr. Baird's methods of television in colour and of producing stereoscopic effects on the receiving screen. There is also an interesting description of the manner in which cinematograph films are transmitted. Public demonstrations of "tele-talkies," as sound films transmitted by television are called, were given recently at the London Coliseum, and an account of these demonstrations is given on page 768 of this issue.

The book is well illustrated by a large number of photographs and many simple but interesting drawings. Among the photographs are pictures of the chief parts of the apparatus for sending and receiving pictures. A series of untouched photographs of the images seen on the screen of a Baird "*Televisor*" receiver are also included, and these show very plainly the great advances that have been made as the result of Mr. Baird's persevering experimental work. The drawings are well chosen to illustrate the manner in which television apparatus works.



The ingenious magnetic device that keeps the scanning disc of a Baird "Televisor" receiver in step with that of the transmitter. (From "Television To-day and To-morrow," reviewed on this page).



A Mass of Frogs' Eggs—a familiar sight in our ponds in the springtime. (From "Nature Rambles" reviewed on the next page).

"Nature Rambles"

EDWARD STEP, F.L.S. (Fredk. Warne. 2/6)

This is one of a series of four, belonging to the "Come with Me" books. Each volume is complete in itself and contains 16 coloured, 15 halftone plates, and many text illustrations. The author's name is sufficiently well known to nature lovers to assure the interest and accuracy of the contents of these books. The one under review deals with the coming of Spring and thereafter we are taken along the hedgerow; to the pond; through the wood; across heath and moorland; and to the chalk lands.

As Mr. Step points out, Spring begins at a different date almost every year. Although the calendar shows us that the season begins on the 21st March and ends on the 22nd June, this is an arrangement by astronomers of which Nature takes little notice! Naturally, a great deal depends upon the weather at this most important time of the year, but Mr. Step shows how even if the ground has a thick covering of snow rambling in Spring-time can be made interesting.

Plants, flowers, animals, insects—all these form the subject matter of these books, which are of a handy size and can conveniently be slipped into the pocket, making charming companions for the country rambler.

The other volumes of the series will be dealt with later.

"The World's Aeroplanes and Airships"

G. GIBBARD JACKSON
(Sampson Low, Marston & Co. Ltd. 6/- net)

The object of a "popular" book on a subject of this nature is to convey to its readers a good general idea of that subject with the minimum of technicalities. In order to achieve this the writer must first make a careful selection of the points with which he intends to deal, and then present each one simply and directly. This is only the superstructure, however, and unless it is based on a foundation of accuracy it is not only useless but actually dangerous. Regarded from each of these viewpoints Mr. Jackson's book is unsatisfactory. One feels that the author has not the grasp of his subject necessary to tell others about it, and his statements are frequently misleading and sometimes quite inaccurate. The book also bears signs of having been written hurriedly, and there are many obvious slips that should have been corrected before publication.

The opening chapters deal with the early history of flying. In the space available too much ground is covered, with the result that instead of a connected story we get a succession of scraps of information, not too well proportioned and not always reliable. Leonardo da Vinci, to whom aeronautical science is considerably indebted, is dismissed in a brief paragraph; and the work of the Montgolfier brothers is emphasised at the expense of the Frenchman Charles, who almost certainly made the first balloon filled with hydrogen. The paragraphs on "blimps" are really astonishing, for the author apparently does not know whether these are observation balloons or airships! Starting with a description of a "blimp" as an observation balloon that has to be hauled down at top speed on the approach of an enemy lest it should receive "fatal injuries," he ends with a combat between a "blimp" and an enemy submarine! In a short account of the splendid work of the Spencers the author refers to them as the "fathers of British aircraft." This statement would have been justifiable if "lighter-than-air" craft had been specified, but as it is it affords a typical example of the author's careless phraseology.

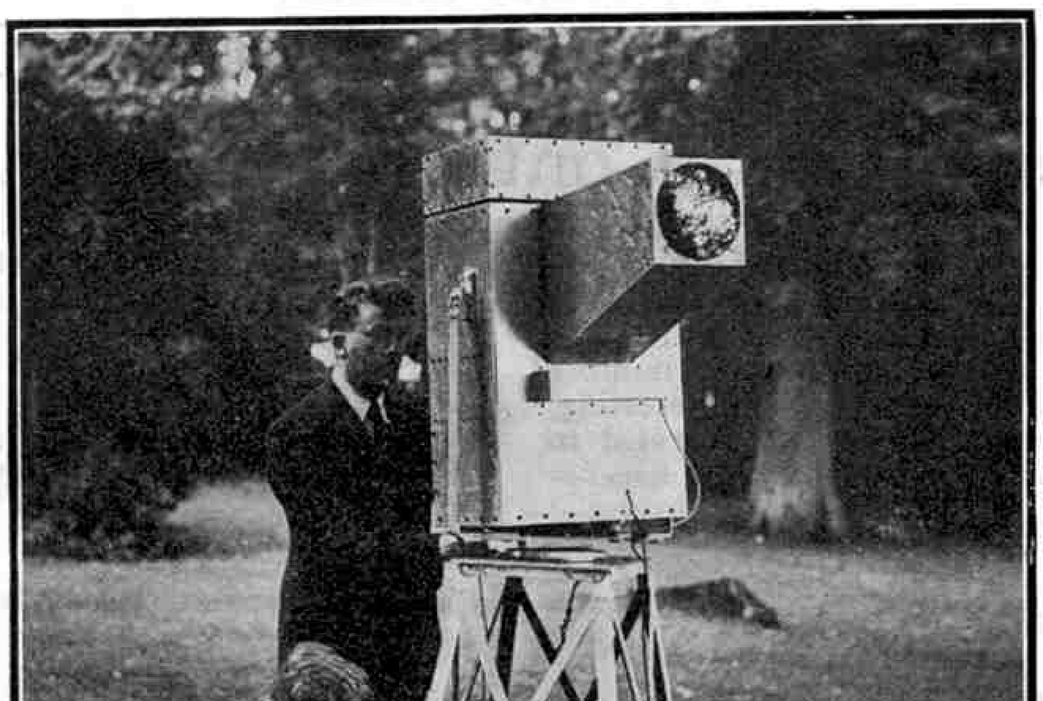
In speaking of modern airships the author blows hot and cold by turns in regard to their value, and his general statements are far too sweeping. The account of "*R.100*" and "*R.101*" is unsatisfactory in many respects, and it is truly surprising to be told that both these vessels use non-inflammable fuel!

After tracing briefly the evolution of the aeroplane the author passes on to deal with the seaplane and the flying boat, and in his opening paragraphs contrives to mix the two, and complicates matters further by reference to the hydroplane. There are various small errors in this chapter, and it is a bad blunder to suggest that Curtiss was the first man to fly from the deck of a ship, this distinction belonging to the late Eugene Ely.

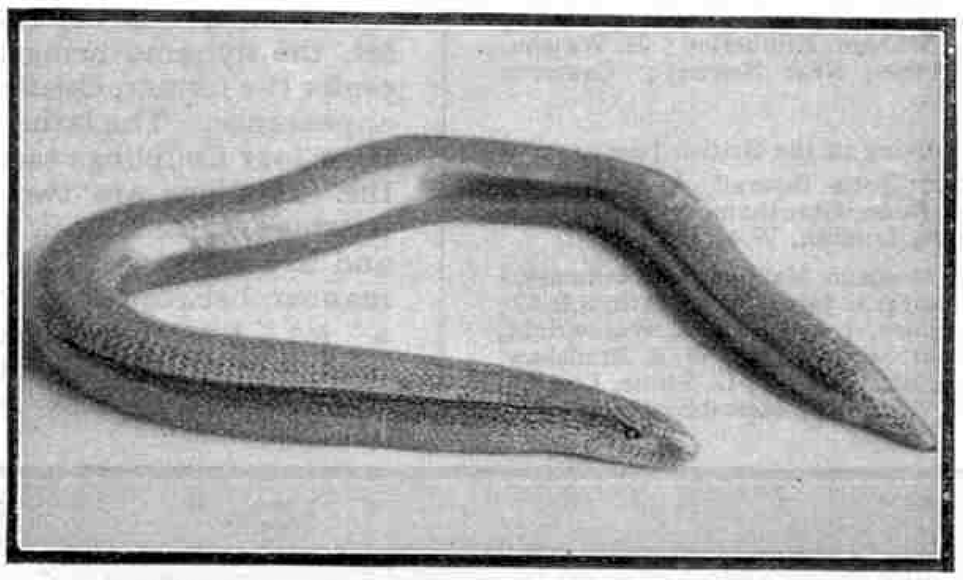
The chapter on the aircraft of Great Britain is one of the least successful in the book. In surveying the various machines the author shows clearly the superficiality of his knowledge of their typical features, and after reading that the "Flycatcher," which is rapidly becoming obsolete, is the "most popular" machine made by the Fairey Aviation Company, one has reason for doubting whether the chapter has any value at all. Other chapters deal with the aircraft of various foreign countries, and here too one notices many statements that require considerable qualification. So many machines are referred to in these chapters that the pages have rather the appearance of a catalogue, and the absence of any index to the book makes it extremely difficult to refer to any particular machine without laborious searching.

The remainder of the book is devoted to famous flights, and here the author is on safer ground. He describes in an interesting manner the conquest of the Atlantic and the Pacific, and the exploration of the Polar regions by air. These chapters would be worthy of praise but for the frequent occurrence of slipshod sentences—sure indications of hurried writing and lack of care in revision.

The book is illustrated by six plates in colour and a large number of well-reproduced photographs of aircraft and aero engines.



The latest type of "Noctovisor" in operation, with Mr. J. L. Baird, the inventor, manipulating the controls. (From "Television To-day and To-morrow," reviewed on the previous page).



A Slow Worm or Blind Worm, as it is also called. This creature is neither slow nor blind and is classified by naturalists among the Lizards. (From "Nature Rambles" reviewed on this page).

"The Book of the Norton"

By W. C. HAYCRAFT
(Sir Isaac Pitman & Sons. 2/- net)

This little book is intended as a standard work of reference for owners and prospective buyers of Norton motor cycles. In it the author describes the very extensive range of models produced by the famous Birmingham firm and gives full instructions on the upkeep of the machines and on the maintenance of the electric lighting equipment and other accessories that are fitted to them. He also gives excellent advice on driving methods and includes many hints calculated to make things easier for the novice.

Although written for Norton owners, the book will be found useful by owners of practically every make of motor cycle, for the reason behind every adjustment is fully explained. It is well illustrated and contains a large number of sectional drawings that help to explain the working of every part of a modern motor cycle.

Interesting New Book

We hope to deal with the undermentioned book in an early issue.

"SEA ESCAPES AND ADVENTURES"
by Taffrail. (Philip Allan. 5/-)

Results of Meccano Model-Building Contests

By Frank Hornby

Third "Simplicity" Contest (Home and Overseas)

JUDGING from the realistic and workmanlike appearance of the models entered in the Third "Simplicity" Competition, many model-builders are becoming adepts at the art of reproducing original and ingenious subjects from only a limited number of parts. The work of judging the entries was very interesting, and after careful consideration of each model it was decided to make awards to the competitors named in the following lists:—

Section A (for competitors over 14 years of age, living in the British Isles).

FIRST PRIZE, cheque value £2-2s.: F. Bearne, Grantham. SECOND PRIZE, cheque value £1-1s.: A. N. Stenning, Seven King, Ilford. THIRD PRIZE, cheque value 10/6: Charles Tindal, Springburn, Glasgow.

TWELVE PRIZES, each consisting of Meccano products to the value of 5/-: Sydney Smith, Edinburgh; J. O'Dwyer, Limerick, Ireland; R. Evenden, Ware, Herts.; W. F. L. Clements, Willington, Co. Durham; J. H. Blackwell, Leicester; Colin Curry, Chester-le-Street, County Durham; F. Mills, Kearsley, Near Bolton; W. F. Wood, Ipswich; J. S. Ingham, London, N.W.2; G. Sproit, Dagenham, Essex; R. F. Newton, Buckhurst Hill, Essex; Victor C. Kaile, Mayford, near Woking.

TWELVE PRIZES, each consisting of a Meccano Engineer's Pocket Book: C. E. Wrayford, Willingstone Cottages, near Moretonhampstead; E. H. Bradshaw Sheffield; L. Kendall, Nottingham; W. de L. M. Messenger, Rochester; E. G. Clayton, Weston, near Otley; Francis L. A. Rourke, Mill Hill, London, N.W.7; Harry Seeve, Westcliff-on-Sea; R. Swainston, Davenport, Stockport; A. O. Marr, Alnwick, Northumberland; B. H. Bray Walton-on-Thames; E. Paul, Otley; S. F. May, Beckenham.

SPECIALLY COMMENDED (Certificate of Merit): Clifford F. Chambers, Southend-on-Sea; James A. Cahill, Oxton, Birkenhead; O. M. Thomson, London, S.E.21; R. Houghton, St. Marks, Cheltenham; Nelson Kirkham, Kimberley; B. Watson, Welby, Grantham; Peter Summers, Three Ashes, Near Newent; Cameron Carswell, Edinburgh; B. Cairns, Dunblane.

Section B (for competitors under 14 years of age, living in the British Isles).

FIRST PRIZE, Meccano products to value £1-1s.: John Boswell, Ayr; SECOND PRIZE, Meccano products to value 10/6: G. K. Benn, Grantham. THIRD PRIZE, Meccano products to value 7/6: Peter Truelove, London, W.14.

TWELVE PRIZES, each consisting of a Complete Meccano Manual (two volumes): L. Totman, Ilford; W. J. R. Peacock, Cheltenham; S. James, Walworth, S.E.17; James Rhodes, Moseley, Birmingham; G. Belshaw, Leigh; D. R. Wainwright, Folkestone; A. Abernethy, Lenzie; D. Broadbent, Shrewsbury; W. A. Bradshaw, Darnall, and Frederick W. Crook (joint award), Sheffield; J. G. Stone, London, N.12; A. S. Boultbee, Woodhouses, Yoxall; R. York, Meersbrook, Sheffield.

SIX PRIZES, each consisting of a Meccano Engineer's Pocket Book: A. Mallock, Guildford; R. H. Tierney, Peckham, S.E.15; G. L. Spickett, North Harrow; Alan Henniker, Edinburgh; K. Mackenzie, Belfast; John Moore, Linthorpe, Middlesbrough.

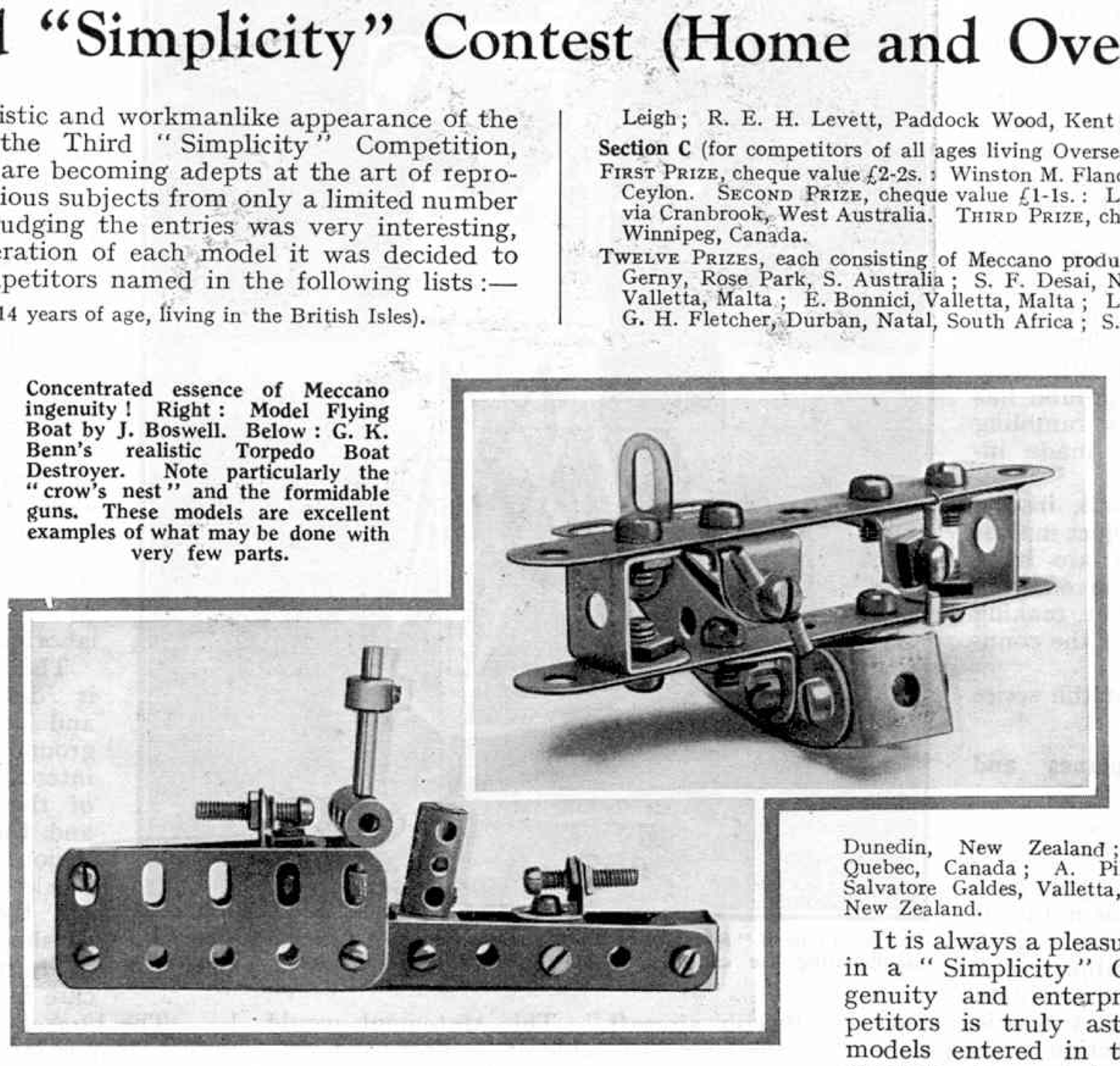
SPECIALLY COMMENDED (Certificate of Merit): W. Ralston Lang, Glasgow, W.4; S. Sumpter, Leyton, London, E.10; J. F. Gabbutt, Mellor, near Blackburn; P. R. Nichols, Leddington, Middlesex; K. G. Cross, Leigh-on-Sea; J. Simmons, Greenwich, London, S.E.10; G. C. Chambers, Peterborough; F. Ogden, Lincoln; R. S. Bratherton, London, S.W.15; S. Lewis, Chatham; C. Thomas, Whetstone, N.20; E. A. Harden, London, S.E.24; E. Towler, Leigh; R. E. H. Levett, Paddock Wood, Kent; A. Cairns, Dunblane.

Section C (for competitors of all ages living Overseas).

FIRST PRIZE, cheque value £2-2s.: Winston M. Flanderka, Bambalapituja, Colombo, Ceylon. SECOND PRIZE, cheque value £1-1s.: L. G. Mauger, Frankland River, via Cranbrook, West Australia. THIRD PRIZE, cheque value 10/6: C. G. Purkis, Winnipeg, Canada.

TWELVE PRIZES, each consisting of Meccano products to the value of 5/-: J. S. Gerny, Rose Park, S. Australia; S. F. Desai, Navsari, India; Charles Galdes, Valletta, Malta; E. Bonnici, Valletta, Malta; L. A. Laskaris, Athens, Greece; G. H. Fletcher, Durban, Natal, South Africa; S. G. Cooke, Ryde, Sydney, Australia; John S. Elder, De. Aar, South Africa; D, Menzies, New Plymouth, New Zealand; M. Maddock, Carbonear, Newfoundland; H. W. Walter, Adelaide, S. Australia; R. V. Mountfort, Ohakune, North Island New Zealand.

TWELVE PRIZES, each consisting of a Meccano Engineer's Pocket Book: I. W. Lochhead, Port Elizabeth, S. Africa; H. Spriggins, East Geelong, Victoria, Australia; B. Birmingham, Toronto, Canada; A. R. Ruddell, Toronto, Canada; B. Jones, Dunedin, New Zealand; C. Blackbeard, Yooville, Johannesburg, S. Africa; T. C. Walker, Westmount, Quebec, Canada; T. MacLachlan, Dunedin, New Zealand; Ken McKay, Westmount, Quebec, Canada; A. Pilgrim, Perth, W. Australia; Salvatore Galdes, Valletta, Malta; W. Figgins, Timaru, New Zealand.



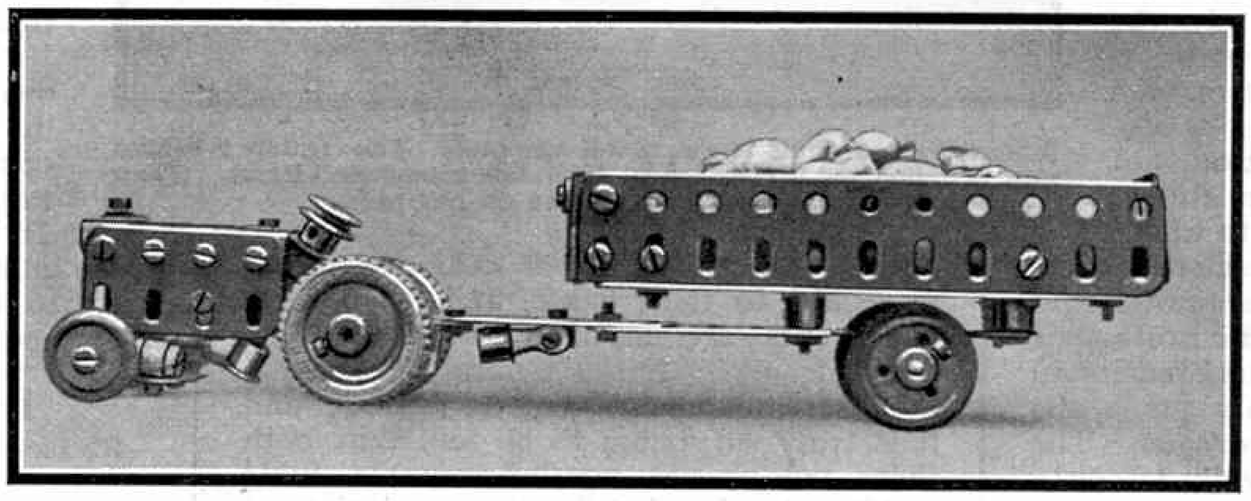
Concentrated essence of Meccano ingenuity! Right: Model Flying Boat by J. Boswell. Below: G. K. Benn's realistic Torpedo Boat Destroyer. Note particularly the "crow's nest" and the formidable guns. These models are excellent examples of what may be done with very few parts.

It is always a pleasure to examine the entries in a "Simplicity" Competition, for the ingenuity and enterprise displayed by competitors is truly astonishing. Some of the models entered in the Third "Simplicity" Contest are wonderfully thought-out and constructed, and must have necessitated great care and patient work on the part of the builders.

A pair of particularly good models are those that secured the First Prize in Section A for F. Bearne. The first is a miniature watch-maker's lathe, and the other reproduces an electric lighting set, the dynamo being driven by a petrol engine. Of the two I prefer the former, chiefly on account of its clean design and realistic appearance. The lathe bed, which is of the barrel type, is built up from four Couplings secured end to end on a Rod. Held between the Couplings are two Flat Brackets, which form the mandrel bearings or headstock. The tail-stock comprises a Flat Bracket and a ½" Reversed Angle Bracket, which are clipped in a similar manner between the Couplings. The lathe bed is supported on a "leg" formed by a Rod, the lower end of which is secured in the boss of a 2" diam. Pulley, to form a base. The driving wheel comprises a 2" Pulley journalled on a short Rod that is secured in one of the transverse holes of a Coupling held on the supporting Rod. The mandrel is driven by means of a piece of string passed round the driving wheel and over a ½" Pulley on the mandrel.

In Bearne's second model a Worm is used to represent the cylinder of the petrol engine. Both models reflect distinct credit on the builder.

A. N. Stenning's tractor and trailer, illustrated on this page, secured the Second Prize in this Section. It will be seen that by the use of 1"



This Tractor and Trailer was entered by A. N. Stenning and won a prize in Section A. The realistic appearance of the model will be noted.

diam. Dunlop Tyres on the rear wheels a very fine effect is obtained. The tractor is fitted with workable steering gear, the stub axle being formed from the collar or " spider " of a Universal Coupling. The front wheels are mounted on $\frac{3}{8}$" Bolts and are fitted with Rubber Rings for tyres. The track-rod is formed by two Flat Brackets and is joined to the steering arms ($\frac{3}{8}$" Bolts) by Collars, steering being effected by a Pawl on the end of the steering column, which engages between the Collars and moves the road wheels either to the right or the left when the steering wheel is turned.

Charles Tindal's model is a field howitzer, and although the complete gun measures only a few inches in overall length, it is capable of firing ammunition (Washers) to a considerable distance and will give a good account of itself when trained on an opposing " army."

A singular feature of this contest is the fact that the younger competitors, that is those entering in Section B, have equalled if not excelled the work of the older and more experienced model-builders who entered in Section A! A typical example of the high standard of excellence attained by the majority of entries in Section B is John Boswell's model flying boat, illustrated here. Considerable ingenuity is displayed in making the propeller blades. Each blade is formed by extending slightly a piece of Spring Cord, a small portion of which is then straightened out and wound round the shank of a bolt, close to the head. A nut is then screwed on the bolt so as to grip the end of the Spring securely. A glance at the illustration will make the method clear.

G. K. Benn's model, a torpedo boat destroyer, is also illustrated, and it will be seen that a very good effect is obtained.

Peter Truelove, who won the Third Prize in Section B, submitted two very creditable models of flying boats. The " floats " in each case are formed from Couplings placed end to end on a Rod, and several Collars and a Coupling similarly secured on a Rod provide an excellent fuselage.

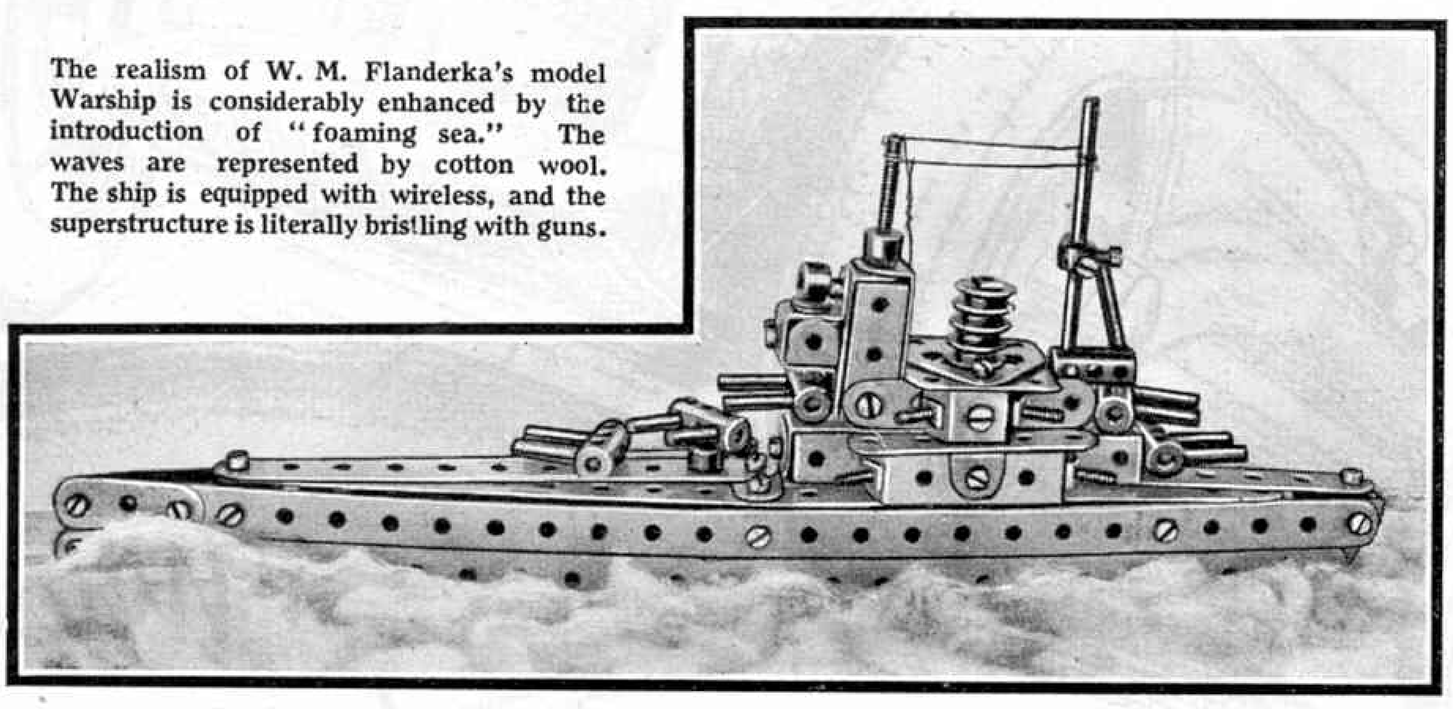
Amongst the smaller prize-winners an amusing little model of a deep-sea diver is conspicuous. It was constructed by James Rhodes. The " arms " and " legs " of the diving suit are represented by Buffers, those forming the " arms " being screwed into opposite transverse holes at one end of a Coupling, which forms the " body " of the suit. The Buffers forming the " legs " are screwed into the set screw holes of Collars held on Bolts which, in turn, are screwed into opposite transverse holes in the lower end of the " body " Coupling. The head consists of a $\frac{1}{2}$" Pinion.

A complete set of furniture for the domestic hearth, including fire-tongs, poker and shovel, was entered by F. W. Crook and W. A. Bradshaw, jointly, and an interesting workable model of an engineer's wheel-brace won a prize for J. G. Stone.

When examining the Overseas entries, I was able to compare the work of model-builders abroad with that of Home competitors, and on this occasion I found very little to choose between the models submitted in the rival Sections. One of the most interesting Overseas models is the fine warship built by W. M. Flanderka and shown in an accompanying illustration. Quite apart from the fact that the model is itself a very praiseworthy effort, the presence of the " foaming sea " adds a touch of realism that sets off the model to the best advantage. The general layout of the vessel follows modern practice in battleship construction, and it will be noted that the decks are literally bristling with guns! A particularly interesting feature is a clock formed by a Pivot Bolt; above this can be seen a searchlight mounted high above the third tier of forward guns.

I would like to mention that while the use of $\frac{1}{2}$" loose Pulleys to form the smoke stack is quite permissible, a better effect would be obtained by using a Chimney Adaptor and Sleeve Piece, for this combination of parts would result in a straight-sided stack that would have the additional quality of being hollow.

L. G. Mauger's entry, a block-setting crane, is another very realistic little model, and one in which a minimum number of parts are utilised to good advantage. The main understructure is built from $2\frac{1}{2}$" Flat Girders, upon which is bolted a 3" Pulley Wheel. Above this Pulley, and secured on a short Rod, is a second 3" Pulley, to which is bolted the entire superstructure and boom. Although the model contains several important features, such as a trolley, winding gear and a swivelling boom, travelling wheels are conspicuous by their absence. For this purpose $\frac{1}{2}$" loose Pulleys held in place on short Rods by means of Spring Clips could be used.



The realism of W. M. Flanderka's model Warship is considerably enhanced by the introduction of "foaming sea." The waves are represented by cotton wool. The ship is equipped with wireless, and the superstructure is literally bristling with guns.

The Third Prize was well merited by Cyril Purkis, who entered the model railway bookstall illustrated, and a model of a seaplane. Purkis is only $5\frac{1}{2}$ years of age, and his efforts therefore are specially commendable. A splendid effect is obtained in the case of the bookstall model. Cuttings of miniature pictures of "*M.M.*" covers and a " salesman " have been introduced with very pleasing results, and the small number and variety of parts used would be hard to reduce. Altogether it is a distinctly meritorious effort and would do credit to an older competitor.

Among the remaining outstanding models may be mentioned a suspension bridge by J. S. Gerny. The bridge itself comprises a $12\frac{1}{2}$" Strip, and the suspension cables and rigging are made from short pieces of thin wire. There are four supporting towers, each of which has a Worm Wheel for a base and a Coupling for the upper part, over which the suspension cables are passed. The $12\frac{1}{2}$" Strip forming the roadway is " nipped " between the Worm Wheels and Couplings, which are themselves secured on short Rods. Fifteen parts only have been used, and the result is very pleasing.

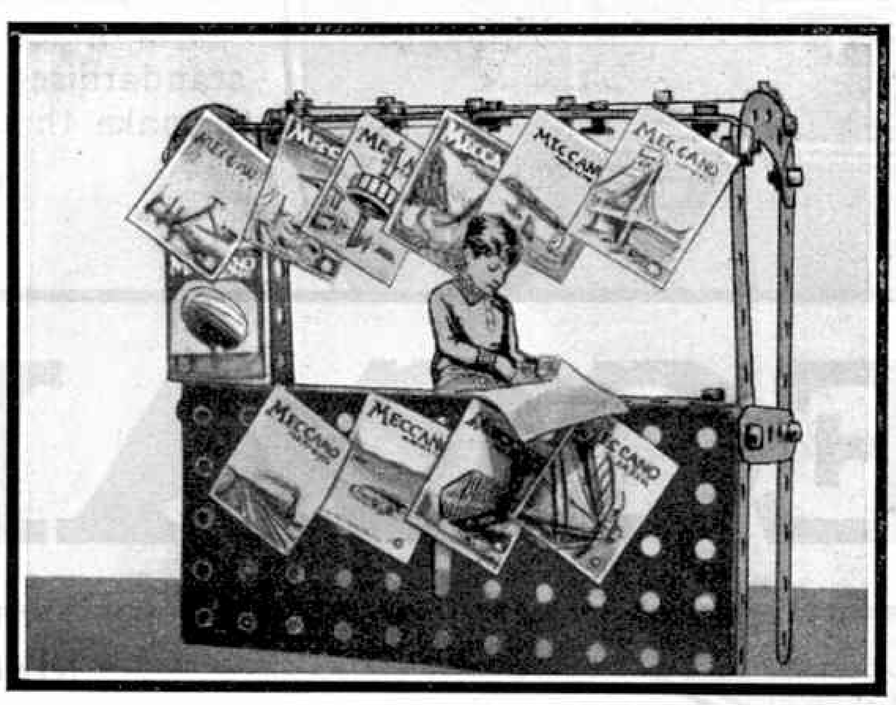
An invalid chair constructed by Charles Galdes embodies several novel features, notably a crankshaft operated by two hand levers. Each of these is provided with a connecting rod and " big-end," the latter being clipped round the crank. Two 2" Pulley Wheels are fitted on the rear axle of the model and external details include a headlight, which is fixed on a bracket above the front wheel.

A remarkable mouse trap built by J. S. Elder secured a prize in this Section. The model may be put to actual use, and is built in similar manner to the familiar spring traps often seen in chandlers and ironmongers shops.

The usual wooden base is represented by a $5\frac{1}{2}$" × $2\frac{1}{2}$" Flanged Plate, to the flanges of which $2\frac{1}{2}$" Strips are bolted in such a manner that they project three holes beyond the end of the plate. Through the outer end holes of each Strip $\frac{3}{8}$" Bolts are passed and their heads spaced as far as possible from the Strip. Upon these Springs are fitted, the other ends being attached to the arms of the " knife." The knife arms (Strips) are pivoted on a Rod journalled in 1" Triangular Plates that are bolted to the flanges of the base. This Rod carries on its ends $\frac{1}{2}$" Pulleys on which the Springs rest when the trap is set. The platform on which the bait is placed is represented by a $2\frac{1}{2}$" Braced Girder balanced in such a way that when a mouse steps on it the platform is depressed and the knife is released. The result is instant death to the mouse!

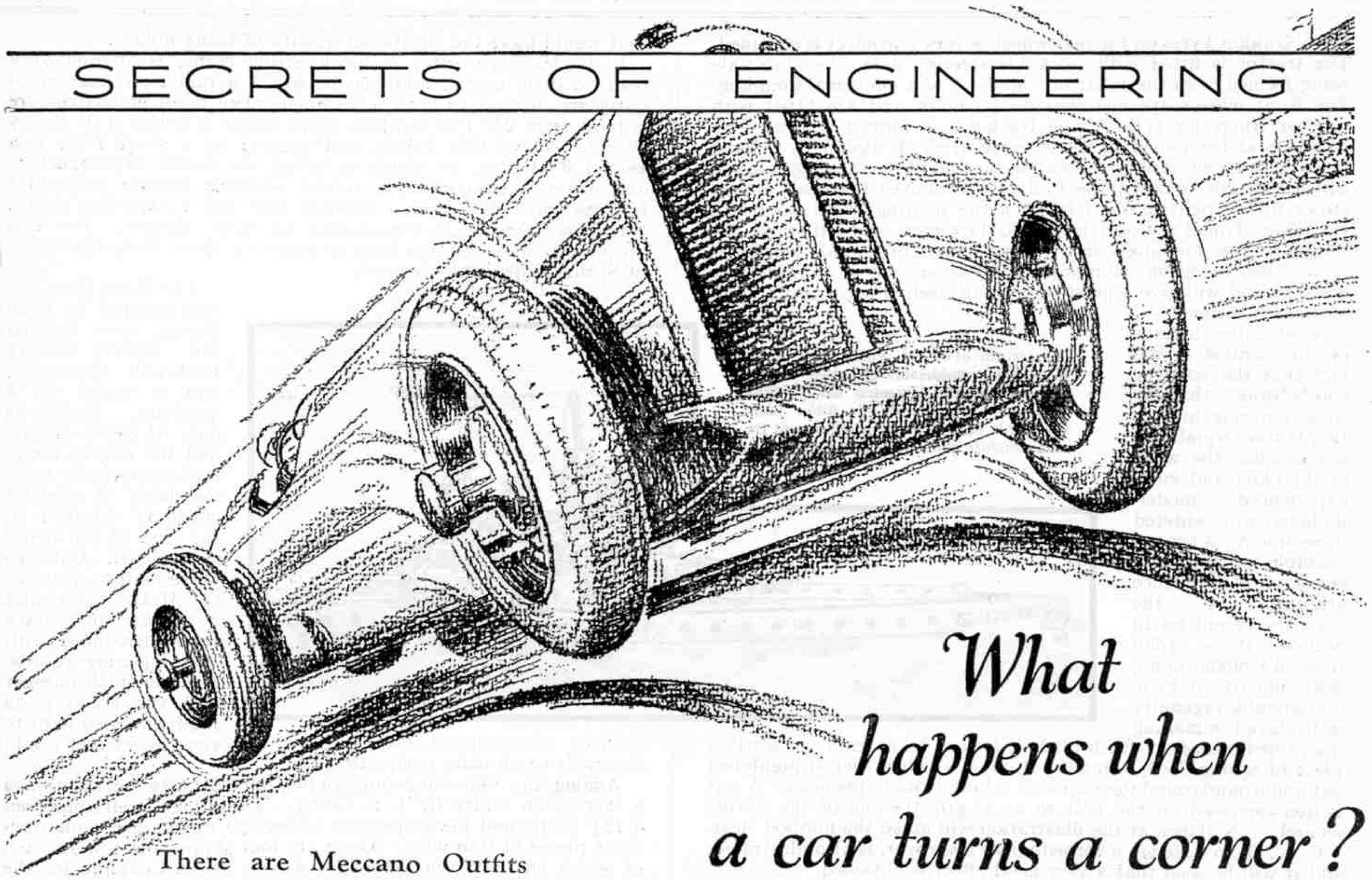
That a Meccano boy is never " hard up " for ideas is evidenced by a number of good models submitted by H. V. Mountfort. These include a seaplane, a quick-firing gun, an outboard motor and a cannon!

The number of really noteworthy entries that were submitted are sufficient testimony to the popularity of the contest, and while I should have liked to mention all of the prize-winning entries, space has permitted me to deal with only those models of particular merit.



"The Meccano Bookstall." A unique model by C. G. Purkis.

SECRETS OF ENGINEERING



There are Meccano Outfits
at all prices from 2/- to 450/-

What happens when a car turns a corner?

This is an easy question for any keen Meccano model-builder to answer, for he holds the secrets of the world's most wonderful mechanisms. He can explain all the details of a differential gear, the mechanism that enables the driving wheels of a car to turn at different speeds when rounding a bend—the inside wheel "marking time" while the other wheel negotiates the outer sweep.

The Meccano differential gear illustrated here is simple to build and works perfectly. It indicates clearly the principle of the differential, and shows how one driving wheel of a vehicle can actually be brought to a standstill while the other continues to revolve, although there is no variation in speed of the driving shaft.

This is only one of the countless number of engineering devices that can be reproduced perfectly in Meccano. By building models the Meccano boy rapidly gains a mechanical knowledge that opens up to him the whole field of invention.

Meccano is real engineering in miniature—all the parts are miniatures of the corresponding parts in actual engineering practice. They are all standardised and interchangeable, and can be used to make thousands of different working models.

Ask your Dealer to show you the 1930 Meccano Outfits

MECCANO

Meccano Limited
Old Swan, Liverpool

Grand Autumn Model-Building Contest

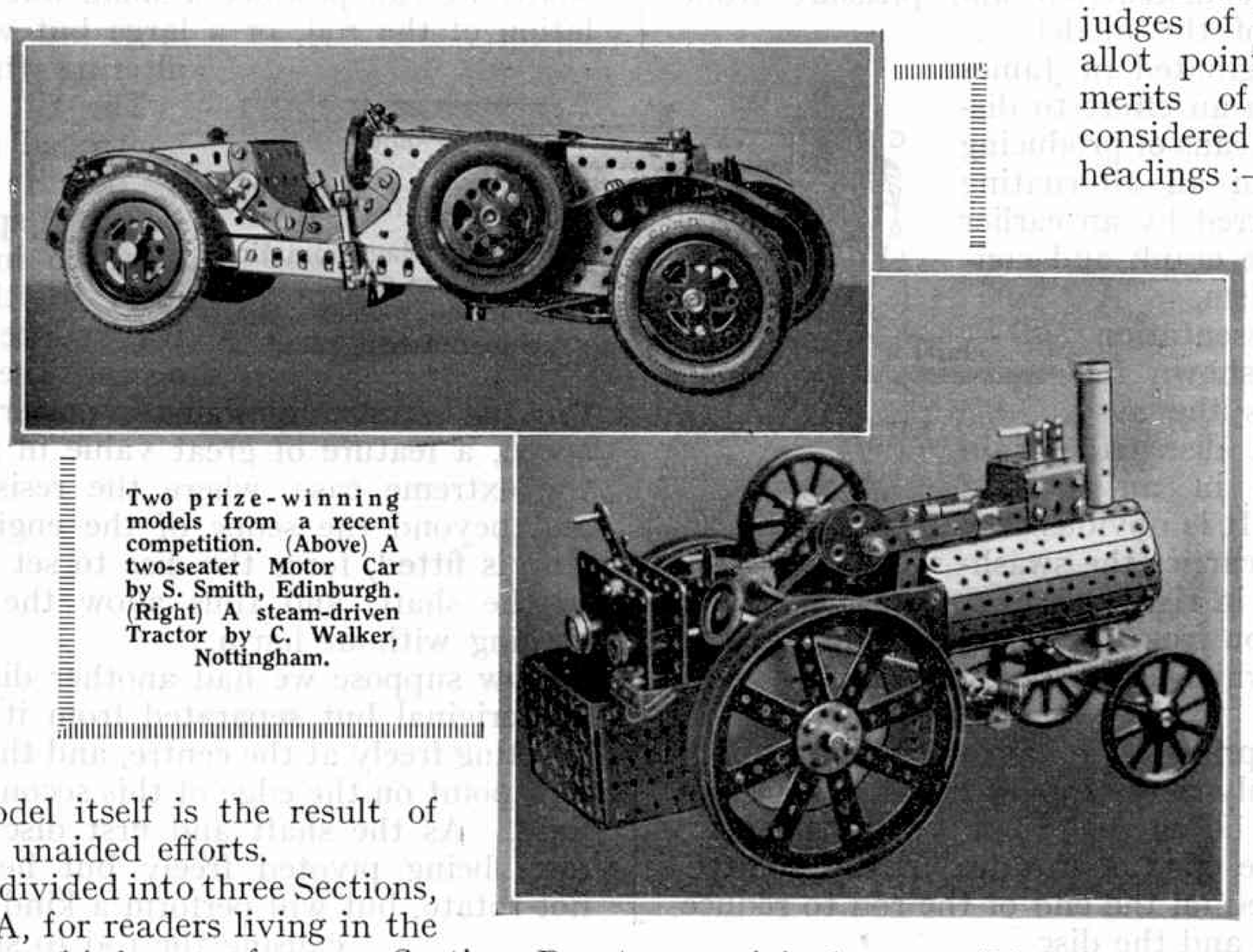
A Fine Opportunity to Win a Splendid Prize

THE first announcement of the Grand "Autumn" Model-building Competition appeared in the September issue of the *"M.M.,"* and many model-builders who read that number will now be occupied in putting the finishing touches to their models.

For the benefit of those readers who did not see the announcement, we are again including full particulars of this splendid Contest so that everyone will have a chance of entering.

In this, as in all previous Contests, every owner of a Meccano Outfit is eligible to compete.

All that it is necessary to do is to build a realistic new Meccano model, and then send a photograph or a good drawing of it to Meccano Ltd. Photographs or drawings need not be the competitor's own handiwork, but it is absolutely essential that the model itself is the result of the competitor's own unaided efforts.



Two prize-winning models from a recent competition. (Above) A two-seater Motor Car by S. Smith, Edinburgh. (Right) A steam-driven Tractor by C. Walker, Nottingham.

The Contest will be divided into three Sections, as follows :—Section A, for readers living in the British Isles and over 14 years of age ; Section B, for readers living in the British Isles and under 14 years of age ; Section C, for readers of all ages living overseas.

The prizes to be awarded in each of the two Sections A and C are as follows :—First Prize : cheque for £3-3s. Second Prize : cheque for £2-2s. Third Prize : cheque for £1-1s. Twelve Prizes, each consisting of Meccano goods to value 10/6. Twelve Prizes, each consisting of Meccano goods to value 5/–. Twelve Prizes, each consisting of a Meccano Engineer's Pocket Book.

The prizes to be awarded in Section B are :—First Prize : cheque for £2-2s. Second Prize : cheque for £1-1s. Third Prize : cheque for 10/6. Twelve Prizes, each consisting of Meccano goods to value 5/–. Six Prizes, each consisting of a Meccano Engineer's Pocket Book.

31st October, 1930, is the last day on which entries may be received in the Home Sections (A and B). Overseas readers must forward their entries so that they reach Liverpool not later than 31st January, 1931. The competitor's age, name and address must appear on the back of each photograph or sheet of paper submitted, together with the name of the competition ("Autumn") and the Section (A, B, or C) in which the model is entered. Envelopes enclosing entries should be addressed to "Autumn" Model-building Competition, Meccano Limited, Binns Road, Old Swan, Liverpool.

How the Models will be Judged

In making the awards, the judges of the competition will allot points according to the merits of each entry when considered under the following headings :—

Construction :—Models should be built on correct mechanical principles and should be strong and cleanly designed. As far as possible only Meccano standard parts should be used, and the parts should not be altered or mutilated in any way. Maximum number of points obtainable under this head—20.

Originality :—Competitors should be as original as possible, either in regard to their choice of subject or to the method of building their models. Maximum number of points—5.

Realism :—Points will be awarded to models according to the degree of realism with which they reproduce the general appearance and the movements of their prototype. Maximum points—10.

General Interest :—Preference will be given to those models that are likely to prove most interesting to Meccano boys generally. Maximum points—5,

Age :—Each competitor's age will be considered and points will be added to the total gained by his model according to the following scale. This will ensure that all competitors have an equal chance.

Section A : Competitors aged 14 years, 10 points ; 15 years, 9 ; 16 years, 8 ; 17 years, 6 ; 18 years, 4 ; 19 years, 2 ; over 20 years nil. **Section B :** Under 7 years, 10 points ; 7 years, 9 ; 8 years, 8 ; 9 years, 6 ; 10 years, 5 ; 11 years, 4 ; 12 to 13 years, 2. **Section C :** Under 8 years, 10 points ; 8 years, 9 ; 9 years, 8 ; 10 years, 7 ; 11 years, 6 ; 12 years, 5 ; 13 years, 4 ; 14 years, 3 ; 15 years, 2 ; 16-18 years, 1 ; 19 and over nil.

The Swashplate

A Meccano Demonstration of a Novel Mechanical Movement

By H. F. Lane

Mr. Lane has designed a Meccano working model of the very interesting mechanism known as the "Swashplate," but before describing the construction of the model he explains in the following article the mechanical principles involved and certain practical uses of the gear. The Meccano model itself will form the subject of a second article, which we propose including in next month's "M.M."

THE "swashplate," although an extremely ingenious and effective mechanism, is not very widely used, and before commencing to construct a model of it Meccano boys may wish to review the essential features and practical applications of the device, so that they can obtain maximum instruction and pleasure from the actual building of the model.

The swashplate originated in James Watt's fertile brain in an effort to discover an alternative means of producing a rotary motion from an alternating one, when he was barred by an earlier patent from using the crank and connecting rod mechanism. A diagrammatical representation of a swashplate is shown in Fig. 1. In essentials the apparatus consists of a disc circular in shape and mounted in an inclined position on a shaft. It is obvious that if the shaft A, which carries the swashplate and is mounted in rigid bearings, makes a half-revolution from the position shown in the figure, the point B, which is furthest to the right, will rise to the point B'.

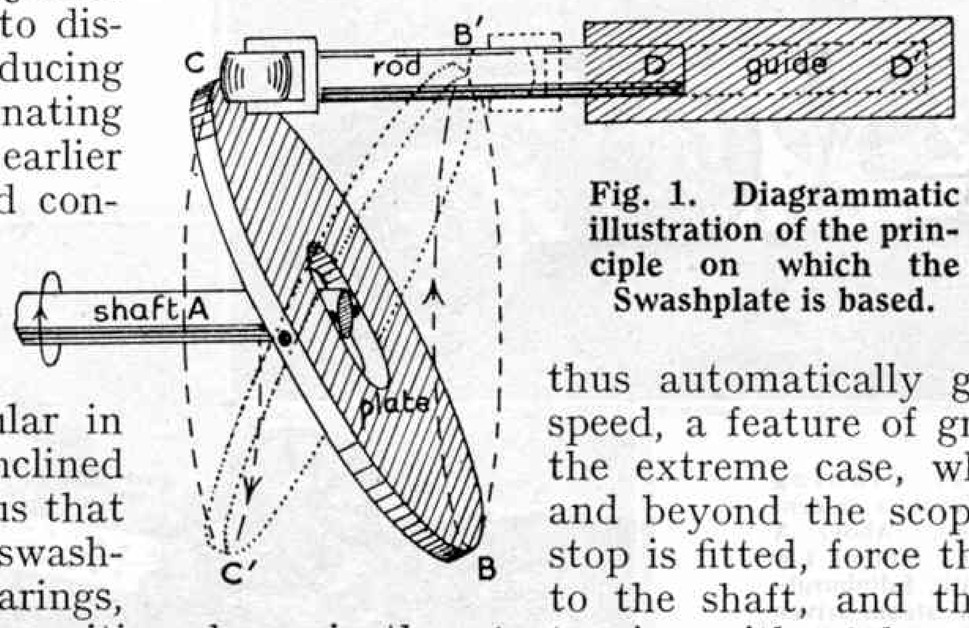


Fig. 1. Diagrammatic illustration of the principle on which the Swashplate is based.

Now suppose a spring-laden rod, travelling in a slide so that it can only move to and fro along the line CB' DD' and cannot be carried round with the disc, is pressing against the edge of the disc at the point C (a roller being mounted on the end of the rod to reduce friction). As shaft A and the disc revolve, the rod will be forced back in its slide, until at the end of a half revolution of shaft A, the rod will occupy the position B'D'.

During the next half-revolution, the rod will gradually emerge from its slide under pressure of the spring, until it again occupies the position CD, after which the cycle will be repeated. Hence we have caused the rotation of shaft A to give a regular oscillatory or to-and-fro motion to the Rod CD.

By a careful study of the diagram it will be seen that the distance CB' is a measure of the angle that the disc makes with the shaft; if we place the disc more nearly at right angles with the shaft, this distance decreases. But it is also a measure of the travel of the rod. Hence, by altering the tilt of the disc we can, for one revolution of shaft A, cause a large or small oscillation of Rod CD, down to the extreme case where the disc is at right angles to the shaft and no motion is imparted to the rod, which thus remains in its mid-position. In other words, for one revolution of the shaft, we can produce a small but very powerful oscillation of the rod, or a large but weak one, by merely altering the tilt of the disc.

The tilt of the disc can be controlled in two ways, either by definite levers, or by a very powerful spring. In the latter case, an increase in the resistance to the rod's oscillation will reduce the tilt of the disc against the force of the spring, thus automatically gaining power at the expense of speed, a feature of great value in many instances. In the extreme case, where the resistance is very great and beyond the scope of the engine, it will, unless a stop is fitted, force the disc to set itself at right angles to the shaft, and thus allow the engine to continue turning without harm.

Now suppose we had another disc, face to face with the original but separated from it by a ball-race, and pivoting freely at the centre, and the rod were connected to a point on the edge of this second disc by a universal joint. As the shaft and first disc revolve, the second disc, being pivoted freely but held by the rod, will not rotate, but will perform a kind of wobbling motion, causing the rod to slide in and out of its groove each revolution. This is the case at any point on the edge of the disc, and we may therefore attach as many rods, each in its own groove, as we require and space allows.

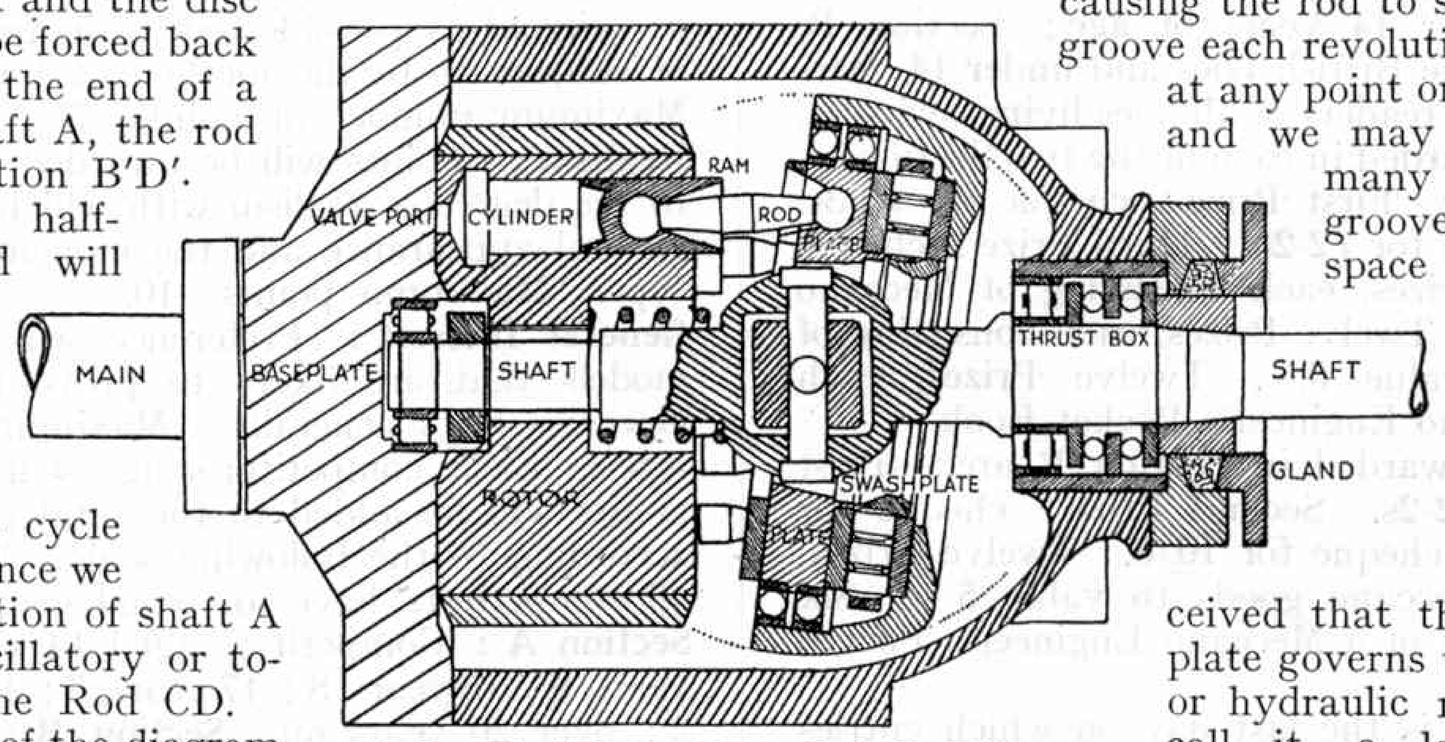


Fig. 2. The "A" or Pump End of a Williams-Janney Double Hydraulic Power Transmission system.

It is easy to see that the rod and the guide in which it slides may be considered as a hydraulic pump. It will also be perceived that the tilt of the swashplate governs the stroke of the rod, or hydraulic ram as we will now call it, a large degree of tilt giving a long but weak stroke, and a small tilt a short but powerful one. By employing a suitable device to transform the hydraulic energy of the swashplate into a mechanical form, the swashplate may be employed in a variety of ways. It may be regarded as a form of variable

gear, for a varying pressure may be generated by it while the driving motor maintains a constant speed. The swashplate has the advantage, too, that the variation obtainable is practically infinite between the zero and maximum strokes of the ram.

One of the most novel uses to which the device has yet been put, is its incorporation in the drive of a well-known car. The swashplate is used generally, however, in hydraulic steering gear, and other uses on shipboard. Mechanism of this type in conjunction with a new form of "hunting gear," is to be found in the steering gear of some of the latest ships, the rudder crosshead being actuated by rams that are alternately supplied and exhausted by the swashplate rams.

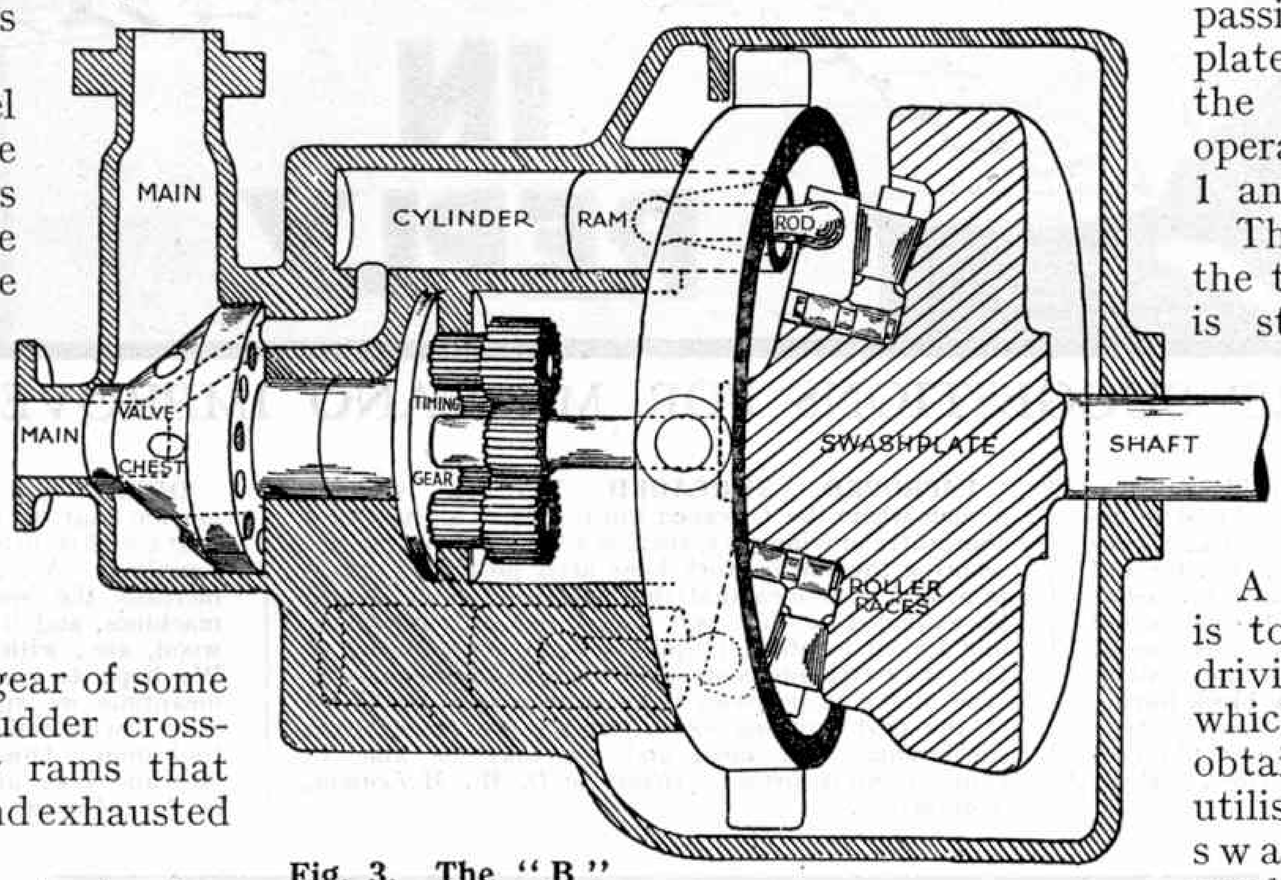


Fig. 3. The "B" end of the Hydraulic Power Transmission system.

Fig. 4 shows a typical steering system with four rams and the necessary piping, etc. The setting of the helm angle, by turning the steering wheel the requisite amount, causes the swashplate to become tilted from its normal vertical position, thus starting the rams working (the motor is running all the time). When the rudder has reached its new position the swashplate will have returned to normal, due to the action of the hunting gear, and the rams will cease working. But as the rudder angle or the ship's speed increases, greater pressure is required from the swashplate to operate the rudder and this is obtained by means of the automatic control of the tilt of the swashplate by springs, which counteract the effect of the increased load in the manner outlined in a preceding paragraph.

The rams are connected to the crosshead secured to the rudder stock and, with the crosshead in the position shown, all four are in use, and the helm is being moved to starboard, or clockwise. Obviously, if we pump additional water into cylinders 2 and 3, these rams will be driven outwards, angling the rudder. But rams 1 and 4 will be driven inwards an equal amount, and there must therefore be an equal amount of water exhausted from these cylinders to make room for them. In other words, we have neither increased or diminished the total quantity of liquid, but merely, by means of the swashplate, transferred a certain amount from cylinders 1 and 4 to cylinders 2 and 3. If the wheel now be put the other way, the swashplate operation will be reversed, and will restore to 1 and 4 the additional water it had transferred to 2 and 3, so that the helm will return to its position amidships.

By means of the valve box, we can use certain cylinders only, instead of all four, but there must always be one under pressure and one open to exhaust. We may employ 1 and 2, 1 and 3, 2 and 4, 3 and 4, or all four—but we cannot employ 1 and 4, or 2 and 3, the valve box being so designed that we can only open out the correct combinations. When, for example, 1 and 2 only are in use, 3 and 4 are joined by a cross connecting pipe, opened out in the valve box, so that the water in these two rams, without passing through the swashplate, flows idly from one to the other when the helm operates under the action of 1 and 2.

The motor is running all the time, even when the helm is stationary, but then the swashplate is at right angles to the shaft, and no liquid is being transferred in the system.

A still further development is to have an electric motor driving a swashplate, from which hydraulic energy is obtained, and this energy is utilised to drive a second swashplate, from which mechanical energy is produced. Thus we have driving and driven rotary motions, connected by a hydraulic transmission that is capable of infinitely varying the power (at the expense of speed) at the driven end for a constant power and speed at the driving end. Examples of this are to be found in electro-hydraulic capstans, etc.

Fig 2 shows the pump, or what is known colloquially as the "A" end, from which the pressure is obtained, of a Williams-Janney double hydraulic power transmission system. The shaft is driven by an electric motor, and carries round with it the rotor and annular thrust plate, which bears against the swashplate proper and is connected to the rams. The swashplate, though co-axial with the shaft, is not attached to it, but is tilted about horizontal trunnions projecting from the inside of the casing. It is obvious that when rotor and thrust plate have made one half revolution from the position shown, the ram at the top will have been forced into its cylinder, expelling the liquid before it. During the half-revolution, the valve-port of this cylinder is sliding over a semi-circular slot in the base-plate which communicates with one hydraulic main. (In this case, as opposed to the explanation in Fig. 1, the swashplate does not revolve, but instead the thrust plate and rotor containing the rams revolve).

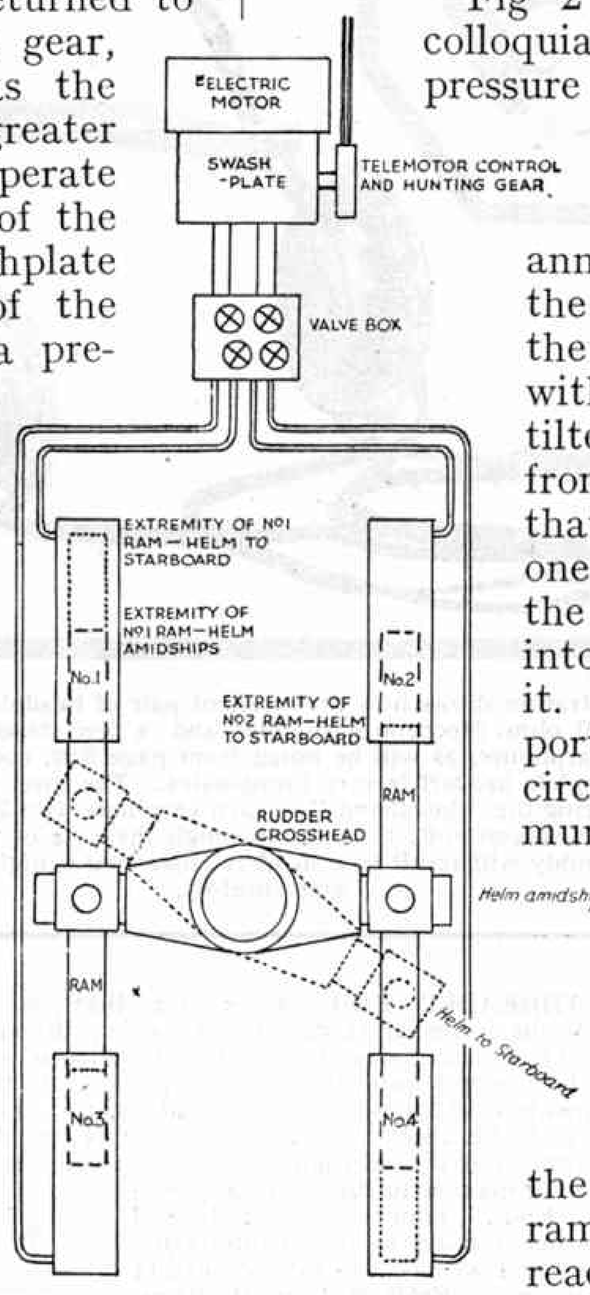
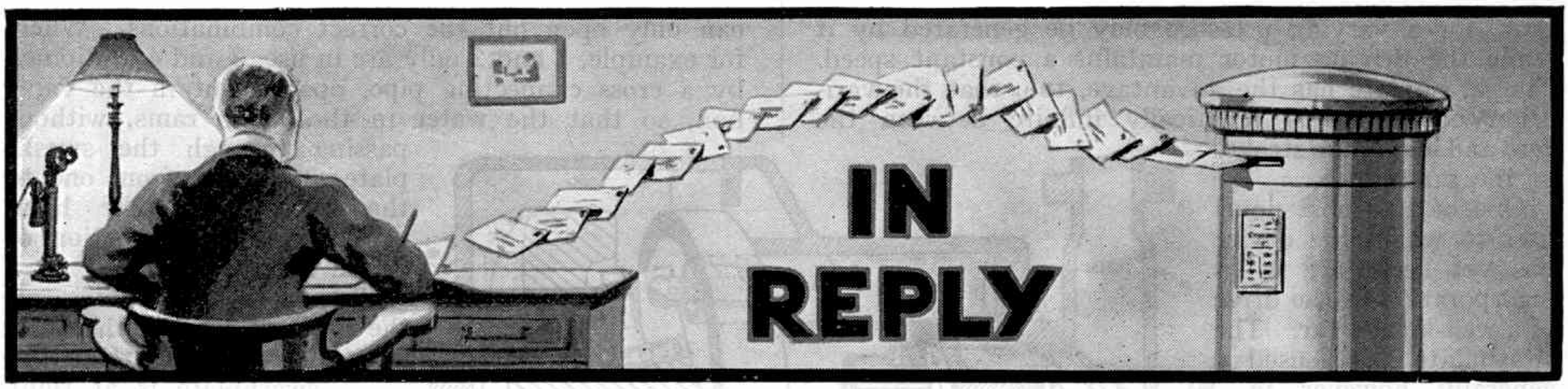


Fig. 4. Diagram showing arrangement of Hydraulic Ship's Steering Gear.

During the next half-revolution, the ram is being withdrawn, and liquid is therefore being sucked into the cylinder. But at the point where the ram changes its direction, the valve port reaches the end of the semi-circular groove, and comes into line with the beginning of a second diametrically opposite semi-circular groove communicating with the other main. Hence there is a steady transference of liquid from one main to the other. There are seven cylinders in all, but the action of each cylinder is the same, and there are always three filling up from one main, three exhausting into the other, (*Continued on page 808*)



READERS' SUGGESTIONS FOR MECCANO IMPROVEMENTS

CONNECTING ROD.—We note your idea that a rod flattened and drilled at one end should be introduced. A part of this type might be used as a connecting rod in models of steam engines, etc., the rod being mounted directly on the crankshaft by means of its perforation, but the uses to which the part could be applied would be very limited, and therefore it would not form a suitable addition to the system. Regarding your idea for a double pulley block having two sheaves mounted at each end, a block of this type is rarely found in actual engineering and it would have no special application in the Meccano system. (*Reply to A. Wautier, Deurne, Antwerp*).

FLANGES ON PLATES.—We have noted your idea that extra flanges should be added to the $3\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate. We do not consider that this alteration would be advisable, however, as the additional flanges would be liable to restrict the uses to which the Plate can be put in a number of models. The remarks do not of course apply to the $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate, as this is considerably larger in size. If additional flanges are required when the Plate is used in a model, you will find it quite a simple matter to bolt $3\frac{1}{2}''$ Angle Girders to the Plate to produce the required result. (*Reply to G. Manlios, Buenos Aires, S. America*).

RUBBER CORDS.—We were interested in your idea that endless rubber cords or bands should be introduced for use as driving belts in small models. The great drawback to this idea is the fact that a very large range of sizes of rubber cords would have to be introduced in order to supply every need met with in model-building, and such a procedure would be very costly. Consequently it would not be advisable to undertake this addition, but model-builders who wish to try out this type of driving transmission should have little difficulty in obtaining suitable rubber bands from stationers, etc. (*Reply to N. O'Neal, Londonderry, Ireland*).

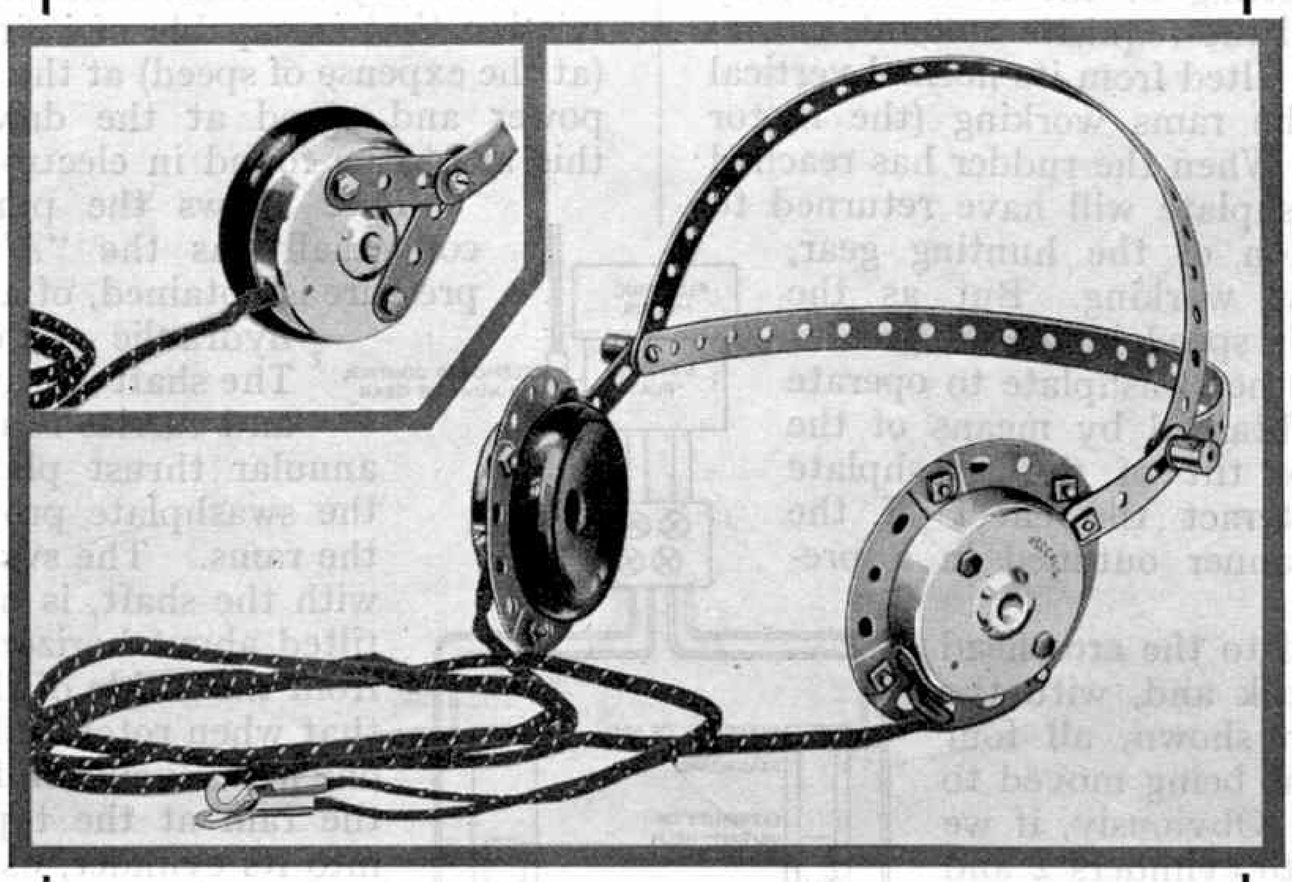
NEW FLANGED PLATE.—We are not in favour of your idea for a $3\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate having flanges on all four sides, as few uses could be found for it in general model-building. Even in the few instances where your suggested part could be employed, it would be quite a simple matter to use a substitute composed of a $3\frac{1}{2}'' \times 2\frac{1}{2}''$ Flat Plate, and four Angle Girders. Regarding your proposed front axle for a motor car, there is no need for this, as a realistic front axle can be built up from standard accessories (see Motor Chassis Instruction Leaflet No. 1). (*Reply to A. Merieux and J. Moncomble, Nice, France*).

IMPROVED 3″ WHEEL.—We note that you think it would be a good idea to form a groove in the rim of the 3″ diam. spoked Wheel so that a 3″ diam. Dunlop Tyre might be fitted to it. This idea is quite sound and we agree that spoked wheels, when fitted to model motors or to the Meccano Chassis, would enhance the appearance of the models considerably. Incidentally we have received quite a number of suggestions of this nature recently and we have therefore placed the scheme before our Production Department for consideration. (*Reply to Maulio Mazziolto, Rome, Italy*).

CONNECTING ROD.—There is no need for us to introduce a special connecting rod flattened and perforated at each end for use in models of steam engines, as a standard Strip of suitable length will serve this purpose admirably. Your suggested part would be very unadaptable. (*Reply to L. Faulkner, London, S.W.2*).

IMPROVED THREADED PIN.—In working models where the Threaded Pin is used as a pivot for a constantly moving part, there is a tendency for the nut securing the Pin to work loose after prolonged operation, and your idea that the threaded portion should be extended so that two nuts could be screwed on and locked together, is quite sound. As a matter of fact, if two Spanners are used when fixing the existing type of Pin in position, there is very little likelihood of the part working loose, but we are nevertheless considering your idea, and we may be able to comment on it further. (*Reply to D. W. McLennon, Manchester*).

An Inexpensive Meccano Telephone Headset



The above illustration shows how an excellent pair of headphones can be built up from two 4,000 ohm. Meccano earphones and a few standard Meccano parts. The Meccano earphones, as will be noted from page 840, cost only 3/– per pair, so that the complete headset is very inexpensive. The inset shows an alternative method of securing the "headband" to each earphone, two 2″ slotted Strips being secured on the hexagon bolts that pass through the case of the receiver. Either method of assembly will result in a headset possessing a high degree of efficiency and comfort.

THREADED ROD.—Your idea that we should introduce special threaded rod having threads that could be engaged with the Meccano Pinion is novel, but we regret quite impracticable. In order that the threads could mesh with the Pinions, the rod would have to be about the same diameter as the Meccano Worm, and it could not then of course be used in a similar manner to the existing Screwed Rod! Your suggested tapped washer appears to be an interesting idea and we hope to give it further attention. (*Reply to A. H. Williams, Cardiff*).

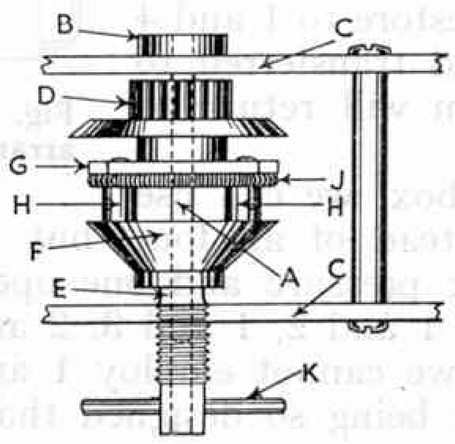
FLEXIBLE STRIPS.—There appears to be quite a number of uses for short perforated Strips prepared from springy tempered steel. They would, for instance, be useful in building up the laminated springs for a model automobile, while doubtless many other uses could be found for them. We hope to consider this idea in the near future. (*Reply to W. Stevens, Cardiff*).

DRILL.—We were quite interested in your suggestion that we should introduce a special twist drill that could be fitted into the bores of standard Meccano Couplings. We agree that a part of this type would increase the realism of model drills and similar machines, and it would no doubt be possible to drill wood, etc., with a model equipped in this manner. We hope to consider this idea further and in the meantime we suggest that you try using a 5/32″ diam. twist drill, which may be obtained from any tool shop. This size of drill will fit in a standard Meccano bore and will function quite well. (*Reply to A. Johnston, Melbourne, Australia*).

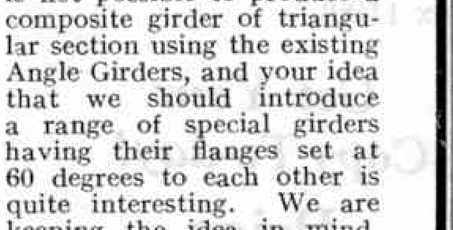
VENTILATORS.—Your suggestion regarding model ventilators is quite interesting. We have in mind the addition of several ship's fittings that cannot be reproduced easily with standard Meccano parts, and it may be possible to consider the introduction of ventilators. Your suggested small screw propeller might also prove useful in models, although it should be possible to build small propellers quite realistically from standard parts. In certain models of ships, for instance, the 2″ diameter Fan (part No. 157) could be used with good effect. We note that you think the Propeller Blades (part No. 41) are too large, but experience has shown that this size of blade "scales" best in the majority of models. (*Reply to R. Legoupillot, Sotteville les Rouen, France*).

NEW RUBBER RINGS.—We note your suggestion that rubber rings for fitting to the 2″ diam. Pulley Wheels should be introduced. These might be of some use as the tyres of small model cycles, etc., and for friction gearing. The 2″ Dunlop Tyre can in most instances be employed for these purposes, however, and consequently we do not consider it advisable to introduce this size of rubber ring. (*Reply to C. W. Lacey, Portsmouth*).

ADJUSTABLE GOVERNOR.—The diagrams and description of your proposed variable speed governor for the Clockwork Motor are very interesting, and for the benefit of readers we are including a sketch showing the main details of the proposed mechanism. The governor shaft A would be held in place between the Motor side plates C by means of a collar B. Its upper end would be journalled direct in the side plate, while its lower end would rotate in a threaded tube E, which could be adjusted in the lower side plate by rotating a key K. The governor shaft A would carry a pinion D, which would couple it to the main gear train of the Motor, a bevelled disc with which the brake lever would engage, and a slotted member G. Small brass weights H would be slipped into the slots in the portion G and would normally be held close to the axle A by an endless spring J. When the shaft A was set in motion, however, the weights H would move outward through centrifugal force and touch the inner surface of a hollow metal cone F secured to the upper end of the adjustable tube E. By altering the position of the cone F, the speed of the Motor could be controlled. This scheme is ingenious, but we are afraid that trouble would result through the weights H jamming against the face of the cone F. However, we intend to give the idea further attention. (*Reply to V. Welsby, Cardiff*).



"FOOTSTEP" BEARING.—Your suggestion that we should introduce a special socket for journalling the ends of vertical rotating shafts, known in engineering as a "footstep" bearing, is quite interesting. As will be seen from the sketch, the bearing would comprise a flanged brass or steel turning in which a "blind" hole A would be drilled to accommodate the end of a standard Meccano Axle Rod. A washer composed of anti-friction metal would be placed in the base of A and would be free to rotate. The upper surface of the washer W would be slightly concave, so that frictional contact between the end of the rotating shaft and the face of the washer would be reduced to a minimum. We agree that it is not possible to duplicate this bearing exactly with existing parts, but when a vertical Rod is to be supported in Meccano mechanisms, you will find that the best way is to mount a Collar close to the end of the Rod and slip the latter into the boss of a Bush Wheel or Double Arm Crank mounted on the basepiece. This form of vertical bearing is far more suited to a miniature engineering system than your proposed "footstep." (*Reply to L. Fisher, Guildford*).



60 DEGREE ANGLE GIRDERS.—At present it is not possible to produce a composite girder of triangular section using the existing Angle Girders, and your idea that we should introduce a range of special girders having their flanges set at 60 degrees to each other is quite interesting. We are keeping the idea in mind, but as there are very few instances where a triangular girder is essential, it is doubtful if many uses could be found for the parts. At present it is possible to improvise a triangular girder by using three Strips or Flat Girders of suitable length and bolting these together in the correct formation by means of Angle Brackets that have previously been bent so that their lugs form an angle of 60 degrees. (*Reply to H. Brown, Sibford*).

NAME PLATE.—Small metal plates on which the name "Meccano" was stamped or printed and fitted with perforated lugs for attachment to models would form quite interesting novelties if added to the system. It is however quite a simple matter to "name" a model after it is completed by cutting out the word "Meccano" from a price list, etc., and mounting this on a small piece of card, which in turn is affixed to the model. Another interesting method that some constructors adopt is to punch out the word "Meccano" on a strip of metal in a "Punch-your-Name" machine and attach this to the model. The resulting nameplate looks most effective, while it costs only a penny! Nevertheless we are making a note of your idea regarding the special metal plate, as it possesses possibilities. (*Reply to F. R. Ashdown, Teddington*).

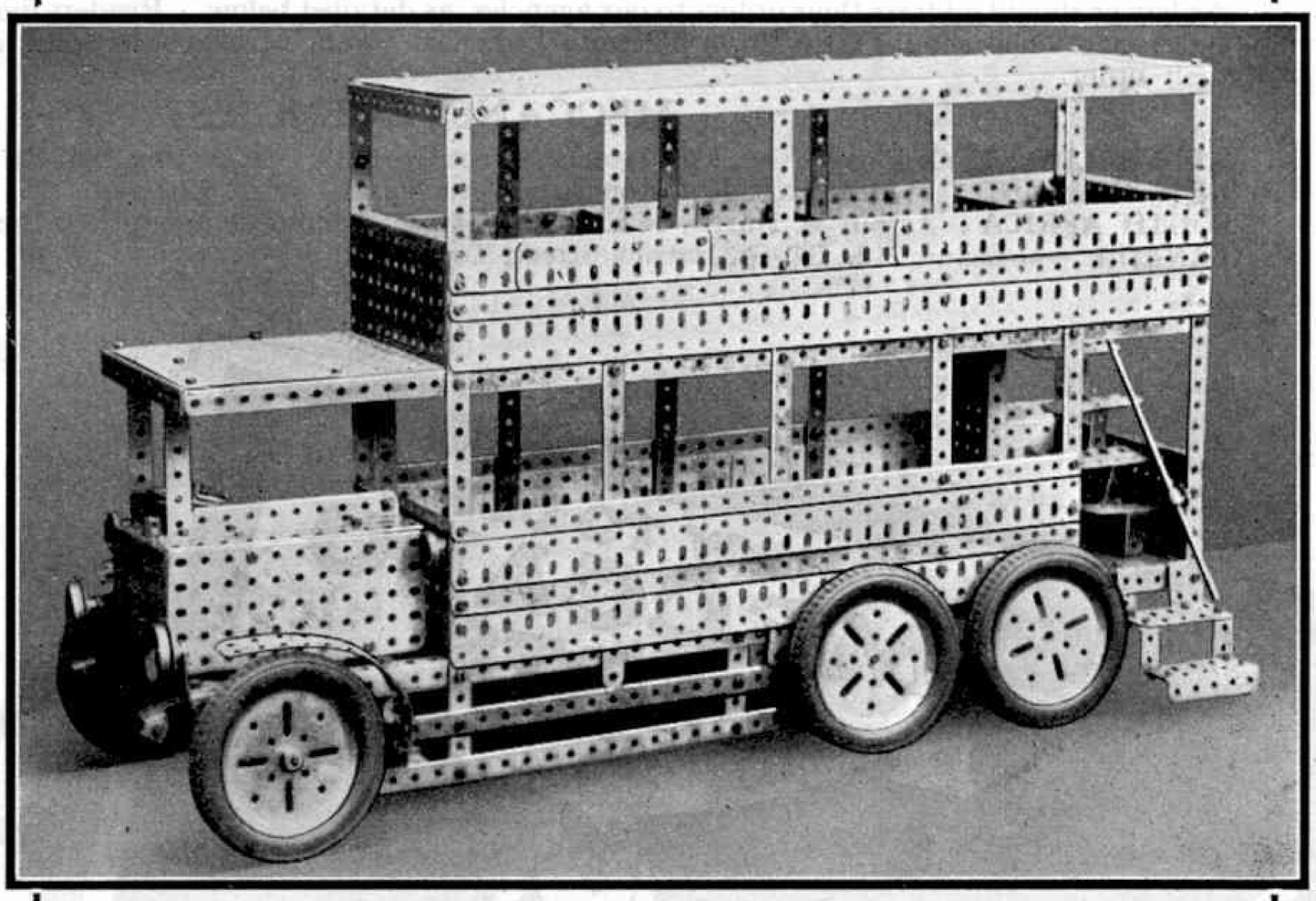
LAMP COVERS.—We note your proposal that small shields made from sheet metal, and fitted with coloured glass or celluloid windows, should be introduced for fitting over the Meccano lamps. These shields could be employed in models of automatic colour signals, electric warning indicators, etc., but you should have little difficulty in making small shields from thin cardboard and coloured celluloid or gelatine. The "coloured glasses" in the Meccano "Automatic Traffic Control Signal" (see "Suggestions Section," June, 1929) were devised in this way. (*Reply to J. R. Sprent, Portsmouth*).

IMPROVED POINTER.—We are interested in your suggestion that the existing Pointer (part No. 156) should be redesigned. Your idea apparently is to delete the "tail" portion of the pointer, as you consider that this portion serves no useful purpose. We would point out to you, however, that the tail portion is of considerable use in delicate mechanisms as it will automatically return the "arrowhead" of the pointer to the zero mark on the scale after the deflecting force has been removed. We are also interested in your suggestion that clock hands should be produced in several sizes on similar lines to your modified pointer. This idea is quite sound, and we hope to consider it. (*Reply to C. Cooper, Ipswich*).

SMALL BALL BEARING.—We were interested in your proposal that conical bearing pieces and suitable balls for constructing a "bicycle" type ball bearing should be introduced. The special cones would be designed so that they could be attached to the bosses of the standard Gears and Pulleys, and when mounted in this way the various wheels could be rotated with a minimum of friction. Numerous uses could no doubt be found for a bearing of this type, and we shall give your idea careful attention. (*Reply to W. D. Butler, Redditch*).

FIBRE DISC.—Small perforated discs cut from fibre or some insulating substance might be of use in the construction of Meccano electrical gear such as rotary switches and similar mechanisms. We are considering this suggestion, and at the same time would remind you that by using the Meccano Insulating Bushes and Washers it is possible to isolate electrically a number of metal contacts mounted on a standard metal Bush Wheel. Your suggestion for an insulated terminal is interesting and has been noted for attention. (*Reply to F. Woods, Newcastle-on-Tyne*).

A WELL-PROPORTIONED MODEL OMNIBUS



Our illustration shows a particularly handsome Meccano six-wheeler motor bus built by Edgar Bell of Felixstowe. The model conveys a good idea of the size and power of a modern double-decked omnibus, and also shows what excellent "coachwork" can be constructed with the aid of standard Meccano parts. For this splendid effort Bell was awarded one of the principal prizes in a recent Model-building Competition.

NEW COLLECTOR SHOE.—A small collector shoe somewhat similar to Part No. 149, but fitted with only one "spoon," might be of some use in the Meccano system. The suggested shoe would certainly be more compact than the existing pattern of current collector, but against this must be placed the fact that a single spoon collector would not provide such a reliable contact as the "double spoon" type. In certain cases where current has to be fed to a motor, etc., mounted in a revolving frame, the suggested small pattern of shoe would be useful, and we are therefore keeping your idea before us. (*Reply to X. Poincet, Paris*).

NEW ANGLE GIRDERS.—Your idea that an Angle Girder 1" long should be produced is quite good. We are rather doubtful as to whether a very large number of uses could be found for the part, but we are nevertheless keeping the idea before us. It would not be advisable however to fit a boss to the 2½" Curved Strip, as the resulting accessory would have little practical application. The Double Arm Crank fulfils the function of a strip fitted with centre boss. (*Reply to F. Marquand, Woodville, New Zealand*).

IMPROVED BOILER.—If the Meccano Boiler (Part No. 162) were embossed in a similar manner to the boiler casing of the Meccano Steam Engine it would certainly look more realistic when fitted to models of steam engines, but you must remember that the Boiler is a very adaptable part, and is used for many purposes such as petrol tanks, pump cylinders, and bonnets, in addition to its function as a boiler. If a steam cock and man-hole covers were embossed on the Boiler they would consequently look very out of place in many models. We regret, therefore, that we cannot consider this alteration. (*Reply to J. B. Forster, Birmingham*).

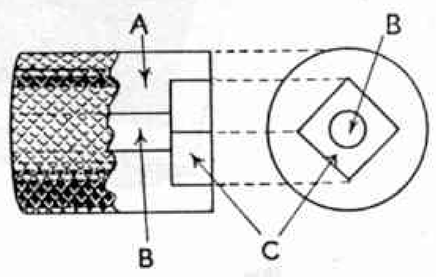
LONGER LENGTHS OF CORD.—We were interested in your suggestion that we should introduce extra long lengths of Meccano cord, and we agree that these would be useful in certain large models such as the Block Setting Crane and the Ship Coaler, where multi-sheave pulley blocks, etc., are employed. We are keeping your idea in mind, and in the meantime would remind you that a number of lengths of Cord if tied together carefully will function quite satisfactorily. When a knot has been tied, you should nip it several times with a pair of flat-nosed pliers, thus rendering it much thinner than at first. A small knot so treated should give little or no trouble when passing round the pulleys in large blocks. (*Reply to D. Garnett, Bournemouth*).

WORM GEAR STIRRUP.—We note your idea that we should manufacture a special casting suitably drilled so that axles carrying a Meccano Worm and a Gear Wheel or Pinion could be journalled in it. The purpose of this part would apparently be to ensure that the Worm and Gear Wheel were kept constantly in mesh, and that the Worm would not "ride up" over the teeth of the Gear when considerable pressure was applied to the axle carrying the latter. This part would be an unnecessary addition however, as you will find it quite a simple matter to build up a rigid stirrup or bracket from standard Meccano parts, and there will be no tendency for the Worm to bind in the teeth of the Gear if the unit is adjusted carefully. (*Reply to N. C. Brown, Glasgow*).

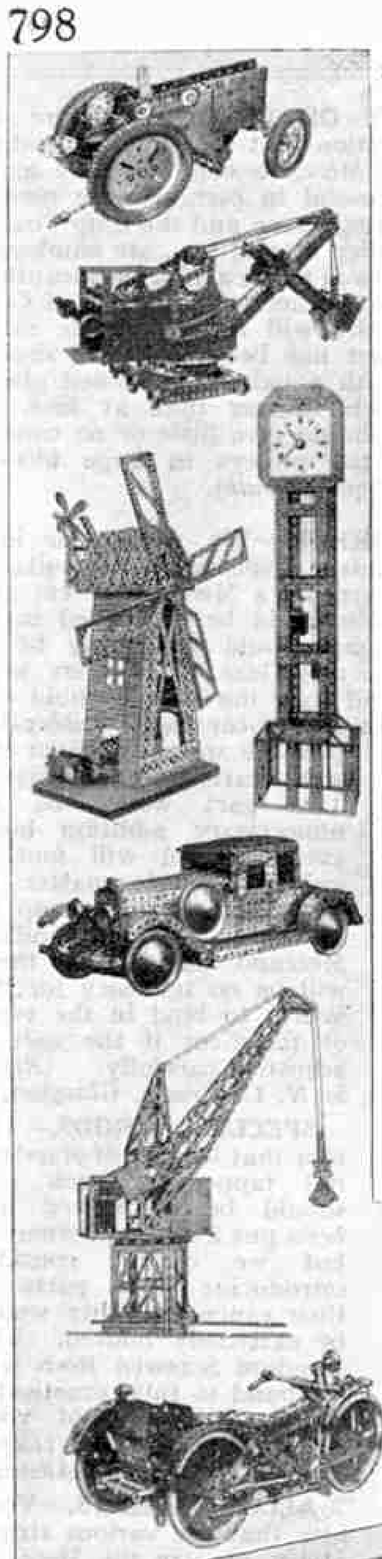
SPECIAL RODS.—The idea that lengths of standard rod tapped at each end should be introduced has been put forward previously, but we cannot consider introducing these parts as their range of utility would be extremely limited. The standard Screwed Rods will be found to fulfil practically all the functions of your suggested accessories. (*Reply to R. C. Randall, St. Albans*).

ALLOY PARTS.—Your idea that the various strips, plates, etc., in the Meccano system should be manufactured from non-ferrous metal is, we are afraid, quite impracticable. We agree that if, for instance, the parts were made from an aluminium alloy, they would be impervious to rust, but they would not possess the requisite strength. In addition, the use of non-ferrous metal would mean a considerable increase in the price of all the parts in the system. (*Reply to S. Jennings, Whitehaven*).

THUMB SPANNER.—The operation of screwing up nuts and bolts is one of the most important in Meccano model-building and new ideas for the simplification of this task are consequently always of interest. Your idea for a special "nut holder" or "thumb spanner" is ingenious, and for the benefit of other readers we are including a sketch of the proposed "gadget" herewith. The holder would consist of a short length of brass or steel rod A milled on its outer surface so as to provide a good grip for the fingers. A hole B (standard axle size) would be bored through its centre and a square recess C formed in one end as shown in the sketch. When using the spanner, a nut would be placed in the recess C and the portion A then rotated by the fingers. As the nut would be screwed into place, the shank of the bolt, etc., would pass down the bore B. We note that you think this device would be useful in screwing up nuts in awkward places, but we are afraid that it would not possess any advantages over the Box Spanner (part No. 34b), on account of its bulk. The key portion of the existing Box Spanner is smaller than your special spanner and consequently it is more adaptable. We are not losing sight of your idea, however, and may be able to give it further consideration. (*Reply to E. Akerman, Newcastle, N.S.W.*).



REVERSING SWITCH.—We are not thinking of introducing a special four-pole reversing switch as a separate unit, as a switch of this type can be built from standard parts. (*Reply to F. Goldberg, Tipton*).



This Manual will help you to build better models

Here is a new Manual that every Meccano model-builder who wants to build better models should have. Its main purpose is to outline the principal uses of the standard parts that together constitute the Meccano System. Detailing every function of every part would be almost impossible, but we believe that by pointing out the special purposes for which the various parts have been designed, together with a few of the other uses that have been suggested from time to time by Meccano boys themselves, we shall help Meccano enthusiasts to build more interesting models, and also to construct them on scientific and practical lines.

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We advise every keen Meccano boy to obtain his copy of this new Manual as early as possible. It may be obtained from any Meccano dealer, price 6d., or direct from Meccano Ltd., Old Swan, Liverpool, price 7d., post free. For Overseas Meccano boys the price is 9d. from dealers, or 10d. post free from the agents (Canadian prices—15 cents from dealers, or 20 cents, post paid, from Meccano Ltd., Toronto).

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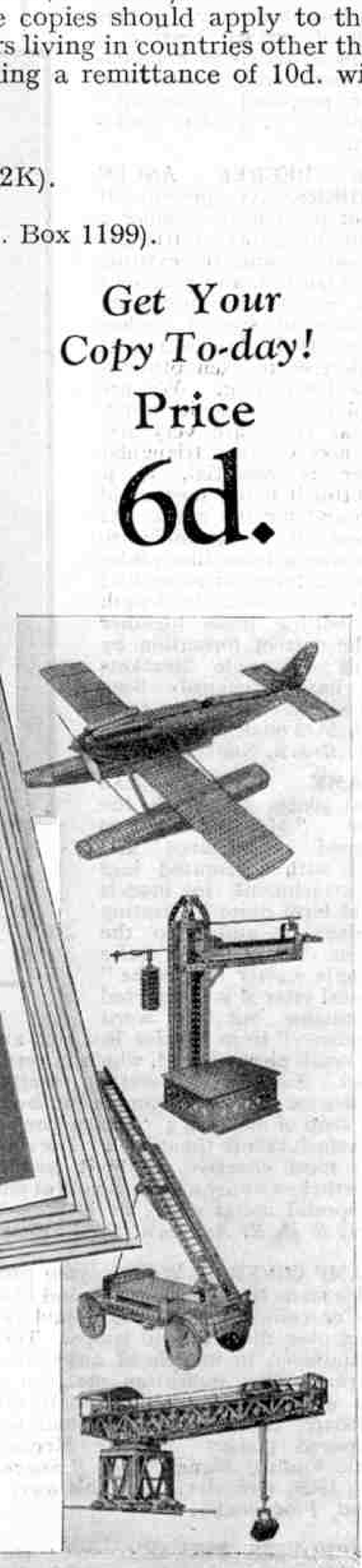
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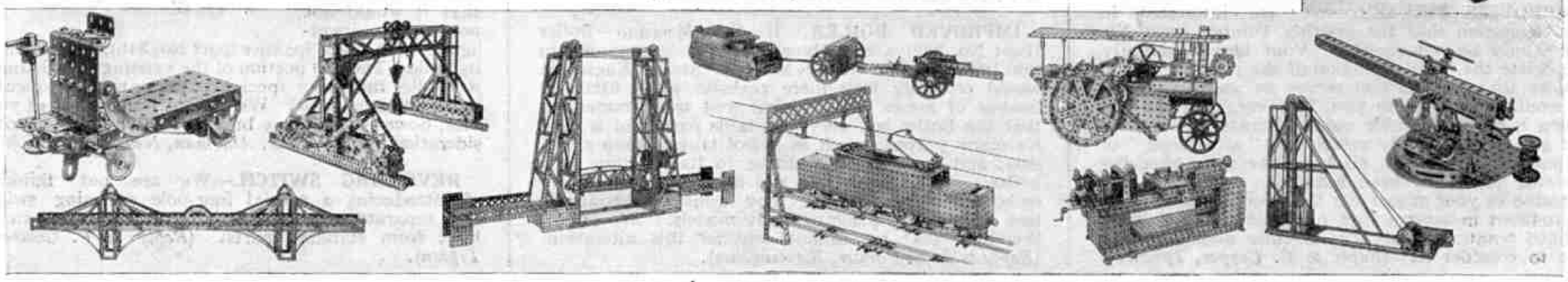
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Suggestions Section

Edited by "Spanner"

The ideas printed in the "Suggestions Section" should prove a real help to thousands of Meccano enthusiasts. Often we receive letters from readers who describe how they have solved some knotty problem or evolved an interesting model after studying some of the ideas that have appeared. We shall always be pleased to receive further contributions for the "Suggestions Section." Cash payments are made for all Suggestions published (excluding those mentioned in the "Miscellaneous" Suggestions column). Contributions should be accompanied by clear photographs or drawings and should be addressed to "Spanner," c/o The "Meccano Magazine."

(205)—Anti-Friction Bearing

(*G. Freyer, Cambridge*)

Ball bearings and roller bearings play a great part in the economical running of machinery, for they reduce very greatly the friction of bearings and thus make available the energy that otherwise would be lost through friction.

In actual engineering practice, and also in Meccano engineering, there are various types of both ball and roller bearings. Most of these are familiar to "*M.M.*" readers, but the type shown in Fig. 205 is rather unusual, and so far as we know has not been reproduced previously in Meccano. It reduces friction to a surprising degree, as compared with ordinary plain bearings.

The axle carrying the flywheel, a Circular Plate, runs on the circumferences of four Face Plates, which are journalled loosely on Pivot Bolts. The pair of Face Plates on each side are arranged so that their inner edges overlap one another. To this end the Pivot Bolts are mounted 2 in. apart. It should be noted that this device can be used only when the load on the axle is exerting pressure in a downward direction.

Proof of the efficiency of this type of anti-friction bearing may be obtained by comparing the length of time that the flywheel spins when running in bearings of the ordinary description and in bearings of the form described.

(206)—Bale Lifter

(*R. Lister, Putney, S.W.15*)

An interesting mechanical movement is demonstrated by the model illustrated in Fig. 206. It should be noted that the model is shown in a form suitable for demonstration, and for practical purposes it will most probably be found necessary to modify it according to requirements.

Two $5\frac{1}{2}''$ Flat Girders are bolted to the side flanges of a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate in which are journalled Rods that carry Couplings 1. The latter have secured to them a 3" Strip attached pivotally by means of ordinary bolts, which are inserted in the transverse holes of the Couplings and are held in place by grub-screws. A $1\frac{1}{2}''$ Strip, connected to one of the Couplings 1, is also attached to a Coupling 2, through the lower transverse tapped bore of which is passed a 2" Screwed Rod. Cranks are secured to the Rods carrying the Couplings 1, and these press equally on the underside of a $5\frac{1}{2}'' \times 3\frac{1}{2}''$ Flat Plate, which forms the platform on which the bales are placed.

When the Bush Wheel 3 on the end of the Screwed Rod is turned, the Coupling 2 is made to advance or recede on the Rod, and thus actuate the Rods carrying the Couplings 1 and the Cranks. In this manner the platform is raised or lowered according to the direction of rotation of the Bush Wheel 3.

The platform slides on two guide rods 4, each of which is attached by Collars to the side flange of the Flanged Plate. The Collars are secured in place by ordinary bolts and are packed out by $1\frac{1}{2}''$ Strips as indicated in the illustration.

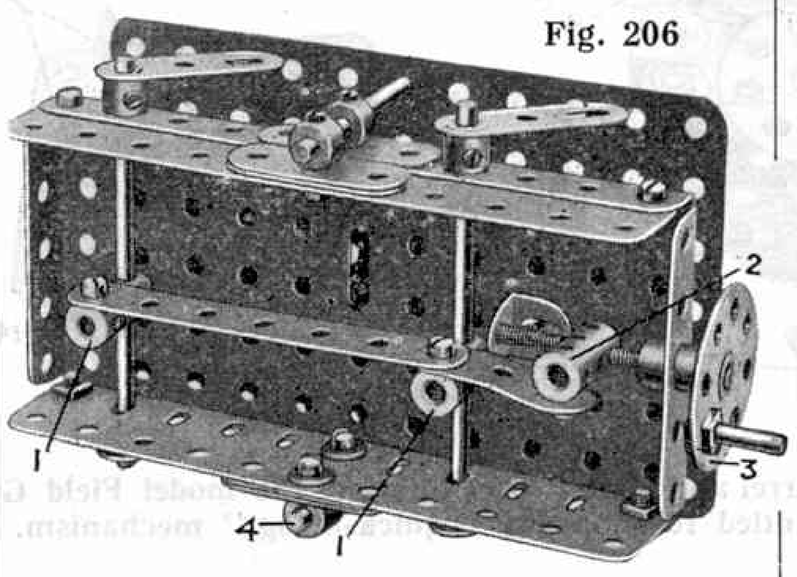


Fig. 206

(207)—Hints for Storing Parts

The following idea by W. Harbord (Normandy, near Guildford) may interest those who take a pride in keeping their parts stored neatly, but find the task not always an easy one. Particularly is this the case with Strips, which have a habit of getting mixed up if kept loose in a large tray or box. In W. Harbord's system, each size of Strip is placed over two screws, which are screwed through the bottom of the tray, point upward, and spaced part the distance between the two end holes of the Strips. If no box is available, several flat pieces of wood are just as suitable and can be stacked on top of each other. In a cabinet with several sliding drawers the heads of the screws should be countersunk.

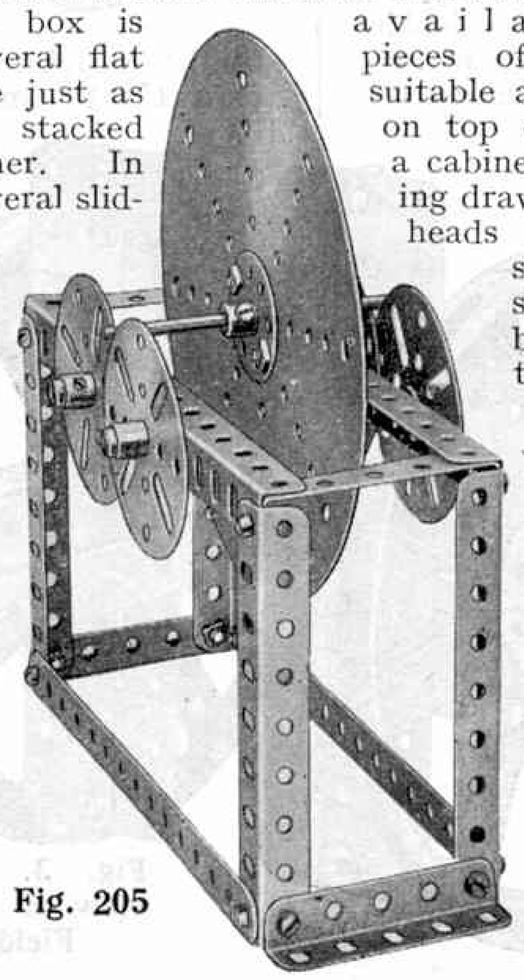


Fig. 205

Miscellaneous Suggestions

Under this heading "Spanner" replies to readers who submit interesting suggestions regarding new Meccano models or movements that he is unable to deal with more fully elsewhere. On occasion he offers comments and technical criticisms that, he trusts, will be accepted in the same spirit of mutual help in which they are advanced.

(M.93). Spring Drawbar for Trailer.—P. Harrad (Manchester) submits an interesting design for a drawbar that may be fitted with advantage to any Meccano model of a trailer. It comprises a Rod, sliding on bearings, on one end of which a Spring (part No. 43) is secured. The other end of the Spring is attached to a fixed portion of the frame of the model, so that undue shocks are absorbed by the Spring. In the original suggestion a length of elastic was used instead of a Spring, but the use of the latter is better practice.

(M.94). Sliding Gears.—The following idea by C. Lea (Birmingham) relates to the sliding of gears along a rotating Rod, and should be useful in numerous gear boxes. A 57-teeth Gear is mounted loosely on the Rod, which carries also two Bush Wheels; and a second Rod is clamped by Collars to the Bush Wheels so that it passes through one of the holes in the Gear. By this arrangement it will be seen that the Gear Wheel, although free to slide longitudinally, must rotate with the Rod. This is an excellent method of representing the "splined" shafting frequently used in actual practice.

(M.95). Remote Control for Light Switch.—A device whereby an electric lighting switch may be operated from any desired point is a valuable asset in a great many cases, and accordingly some of our readers may like to "try their hand" at the apparatus invented by A. Wood (Rotherham). A pulley is mounted on a suitable support on the wall immediately below the switch—care must be taken to obtain parental consent before fixing this!—and a length of string is secured to the switch knob, passed round the Pulley and round further guide pulleys to the operating handle. The last named consists of a short Rod journalled in a suitable bearing and carrying a 1" Sprocket Wheel and a Bush Wheel, which forms the operating knob. The two ends of the string are secured to a short length of Sprocket Chain, which passes round the 1" Sprocket, so that when the operating knob is turned the switch is moved to the "on" or "off" positions according to the direction of rotation of the knob.

(M.96). An Internally-toothed Gear.—A very ingenious and compact internally-toothed gear has been arranged by G. Cogdon (St. Albans). It consists of a $1\frac{1}{2}''$ and a $\frac{3}{4}''$ Contrate placed together, face to face, in such a manner that the smaller lies inside the periphery of the larger.

New Meccano Models

Field Gun—Biplane—Land Yacht—Swing—Charabanc

THE month of October marks the commencement of those much-talked-of periods known as the "long winter evenings." To some people evenings indoors represent nothing but dull and uninteresting hours during which hobbies are indulged in merely to pass the time; but this is not the case with the Meccano boy. With his outfit before him and details of some interesting new models to build, he has a splendid source of entertainment that will not only make the hours slip by in marvellous fashion, but at the same time will give him a sound knowledge of mechanics and engineering matters generally that will be of the greatest advantage to him in future years.

Field Gun

The first example to be described this month is the model Field Gun shown in Fig. 3. This model incorporates an ingenious "quick firing" or "repeater" action by means of which twelve Meccano Steel Balls, which form the "shells," can be fired in succession at one loading.

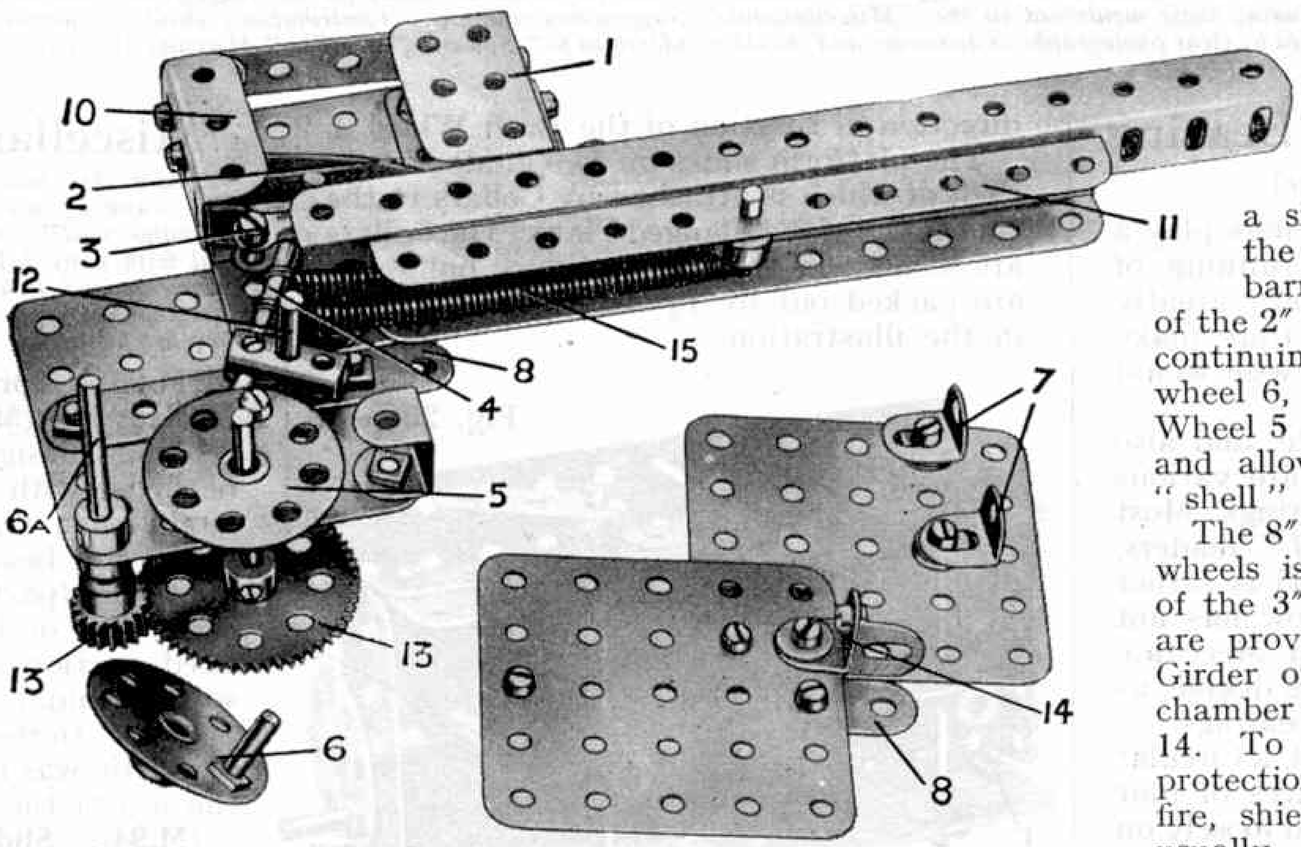


Fig. 1. The barrel and magazine chamber of the model Field Gun partly dismantled to show the "quick-firing" mechanism.

The construction of the model should be commenced by assembling the gun barrel and magazine chamber. This is shown removed from the undercarriage and partly dismantled in Fig. 1.

Each side of the magazine chamber is built up from two $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flat Plates with corners overlapping. The two upper plates have two $1\frac{1}{2}''$ Angle Girders 10 and one Channel Bearing 1 (see Fig. 1) bolted to them, and the bottom Plates are joined together by a Double Bracket. The barrel of the gun consists of two $7\frac{1}{2}''$ Angle Girders secured together to form a channel by two bolts at the "breech" end. The end bolt also holds a Double Bracket in place inside the barrel, and the dummy recoil chamber, which consists of two $5\frac{1}{2}''$ Angle Girders 11, is secured in position underneath the barrel by the second bolt.

A 2" Axle Rod, forming the discharge plunger, slides in the two holes of the Double Bracket that is secured inside the gun barrel, and a Small Fork Piece 3, carrying a $\frac{3}{8}''$ Bolt, is fastened on the end of the Axle Rod. A second 2" Rod 4, working freely in the jaws of the Small Fork Piece, is secured to a Coupling that is pivoted on the Rod 12.

The mechanism operates in the following manner. On turning the Bush Wheel 6 (see Figs. 1 and 2), which is secured to the Rod 6a, the Bush Wheel 5 is rotated slowly through the reduction gearing 13, which consists of a $\frac{1}{2}''$ Pinion and a 57-teeth Gear Wheel. The Bush Wheel 5 carries in one of its radial holes a $\frac{3}{8}''$ Bolt that strikes the lower portion of the Rod 4 and pulls back the Small Fork Piece 3, which is attached to the plunger, against the action of the Springs 15. The plunger is now clear of the space between the 2" Strip 2 that forms the floor of the "magazine," and the end of the Channel Bearing 1; and this movement allows a single Steel Ball to fall from the magazine chamber into the barrel directly in front of the end of the 2" Rod forming the plunger. On continuing the movement of the hand wheel 6, the Bolt secured to the Bush Wheel 5 slips off the end of the Rod 4, and allows the plunger to strike the "shell" and so shoot it from the gun.

The 8" Axle Rod that carries the road wheels is journalled in the end holes of the 3" Strips 8, and "axle covers" are provided by bolting a $1\frac{1}{2}''$ Angle Girder on each side of the magazine chamber to the $\frac{1}{2}'' \times \frac{1}{2}''$ Angle Brackets 14. To provide the gun crews with protection from machine gun and rifle fire, shields of heavy gauge steel are usually provided; and these are represented in the model by two pairs of $5\frac{1}{2}''$ Angle Girders overlapped and bolted together, and secured to the sides of the magazine chamber by means of the Angle Brackets 7.

The trailing girder is built up from two $7\frac{1}{2}''$ Angle Girders joined together at the outer end by means of a $1\frac{1}{2}''$ Strip and secured at the inner end to the lower holes of the plates forming the magazine chamber. The elevating apparatus consists of a 2" Threaded Rod, surmounted by a hand wheel 9, consisting of a Bush Wheel fitted with a Threaded Pin, the Rod working in a Threaded Boss secured to the $7\frac{1}{2}''$ Angle Girders by Bolts fitted with Washers for spacing purposes.

A number of $3\frac{1}{2}''$ Strips are bolted to each side of the trailing girder to balance the weight of the gun barrel and magazine. When the gun is assembled, a $5\frac{1}{2}''$ Strip should be placed in position along the top of the barrel and secured to the Channel Bearing 1 by means of a $1'' \times 1''$ Angle Bracket.

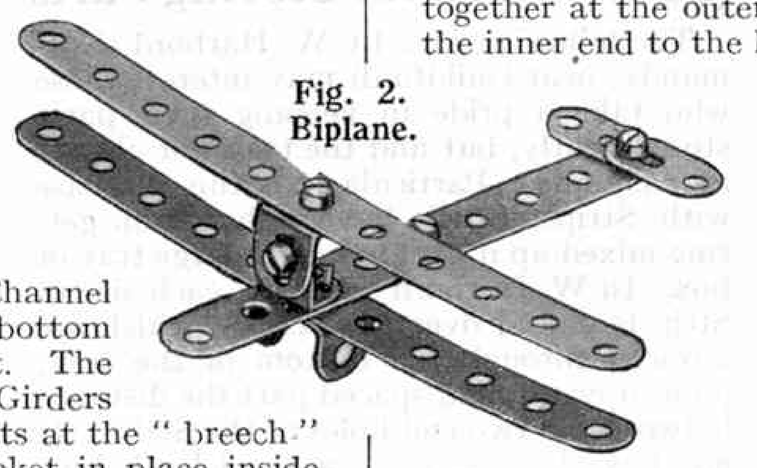


Fig. 2. Biplane.

In order to build the Field Gun the following parts will be required:—1 of No. 2; 24 of No. 3; 2 of No. 4; 1 of No. 5; 1 of No. 6; 1 of No. 6a; 4 of No. 8b; 2 of No. 9; 4 of No. 9f; 2 of No. 11; 9 of No. 12; 1 of No. 12a; 1 of No. 14; 4 of No. 17; 2 of No. 18b; 5 of No. 24; 1 of No. 26; 1 of No. 27a; 52 of No. 37; 4 of No. 37a; 20 of No. 38; 2 of No. 43; 9 of No. 59; 1 of No. 63; 1 of No. 64; 4 of No. 72; 1 of No. 81; 4 of No. 103; 6 of No. 111c; 1 of No. 114; 2 of No. 115; 1 of No. 116a; 2 of No. 118; 1 of No. 160.

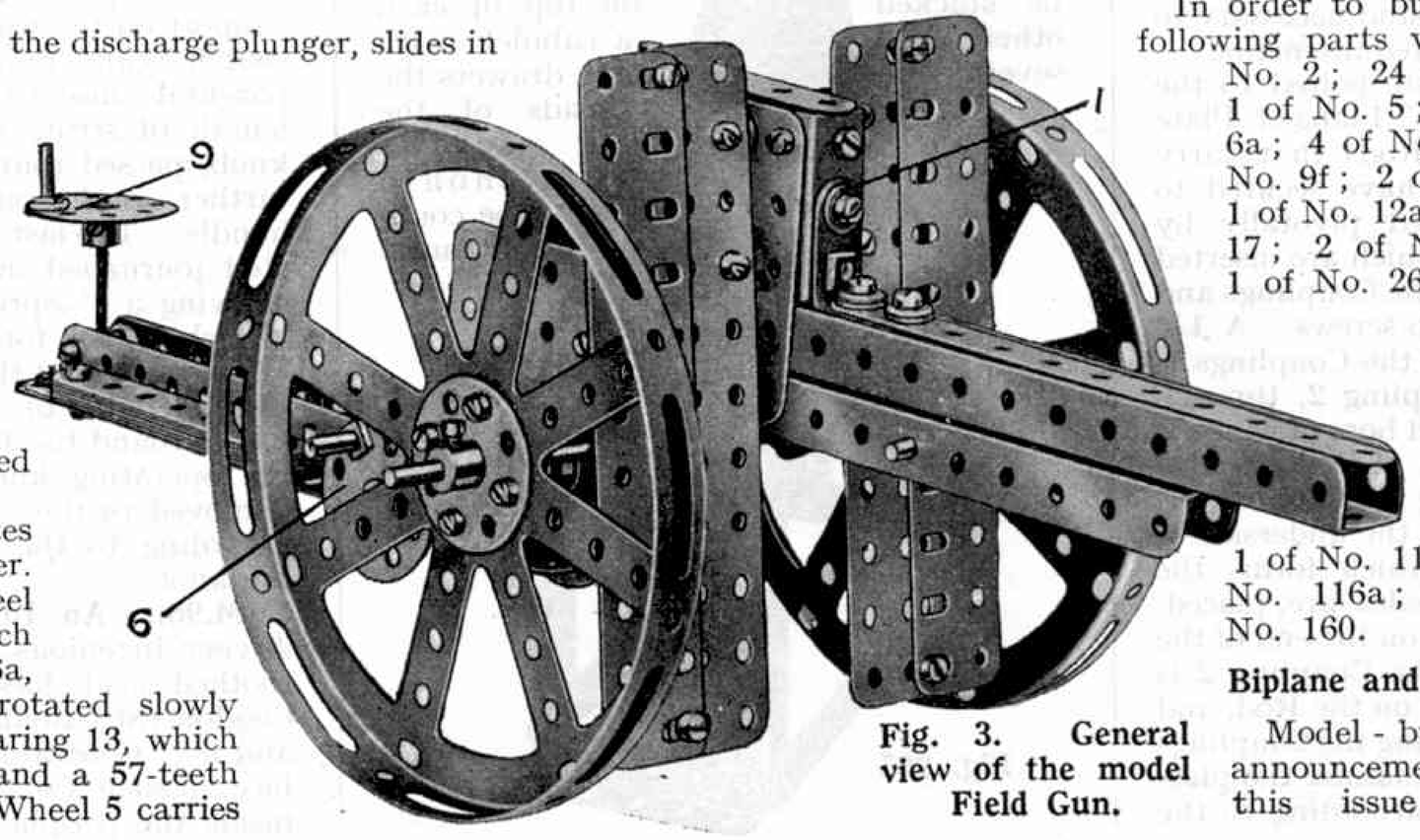


Fig. 3. General view of the model Field Gun.

Biplane and Swing

Model-builders who read the announcement on page 824 of this issue regarding the new

"No. 000" Outfit will be interested in the model biplane and swing shown in Figs. 2 and 4 respectively, as both these models can be built from the parts contained in the new set.

The "No. 000" Outfit is specially intended for beginners, but it contains a splendid selection of standard Meccano parts, and it is surprising what realistic results can be produced by means of them. The two typical examples shown will well repay the few minutes spent in assembling them. The construction of both models is clearly shown by the illustrations and it calls for no special comment.

In order to build the Biplane the following parts are required :—3 of No. 2 ; 2 of No. 10 ; 1 of No. 11 ; 2 of No. 12 ; 5 of No. 37.

For the model Swing the parts used are :— 2 of No. 2 ; 2 of No. 5 ; 2 of No. 12 ; 1 of No. 17 ; 2 of No. 23 ; 2 of No. 35 ; 9 of No. 37 ; 1 of No. 52 ; 2 of No. 126.

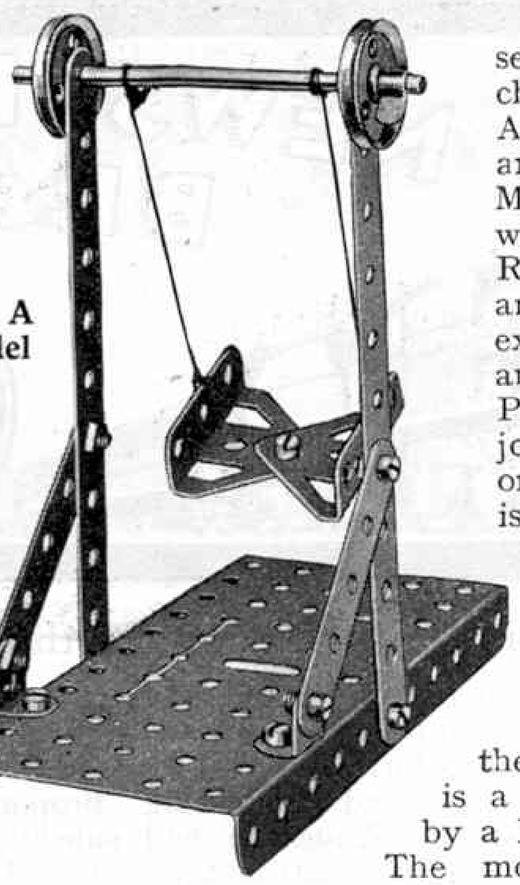


Fig. 4. A simple model Swing.

Land Yacht

A novel subject has been chosen for the model shown in Fig. 5. Although yachts of this type are not common, especially in this country, they provide excellent sport when "sailed" on a level surface such as a big stretch of sand, and in a good breeze really high speeds may be attained.

The "chassis" of the yacht consists of two $12\frac{1}{2}''$ Angle Girders bolted to a Sector Plate at the stern and attached to a $12\frac{1}{2}''$ Angle Girder at the front. A further $12\frac{1}{2}''$ Angle Girder is also bolted to the centre of the chassis frame to provide a mounting for the mast.

The rear pair of wheels are mounted on $\frac{3}{8}''$ Bolts passed through the upturned ends of a $3\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip, the set screws in the Pulley Wheel bosses gripping the shanks of the Bolts. A Bush Wheel is attached to the centre of the Double Angle Strip and a 2" Rod is secured in its boss. The Rod passes up through a Double Bent Strip attached to the underside of the Sector Plate, and a Crank is secured to its upper end. A $3\frac{1}{2}''$ Strip is bolted to the Crank to form the "tiller."

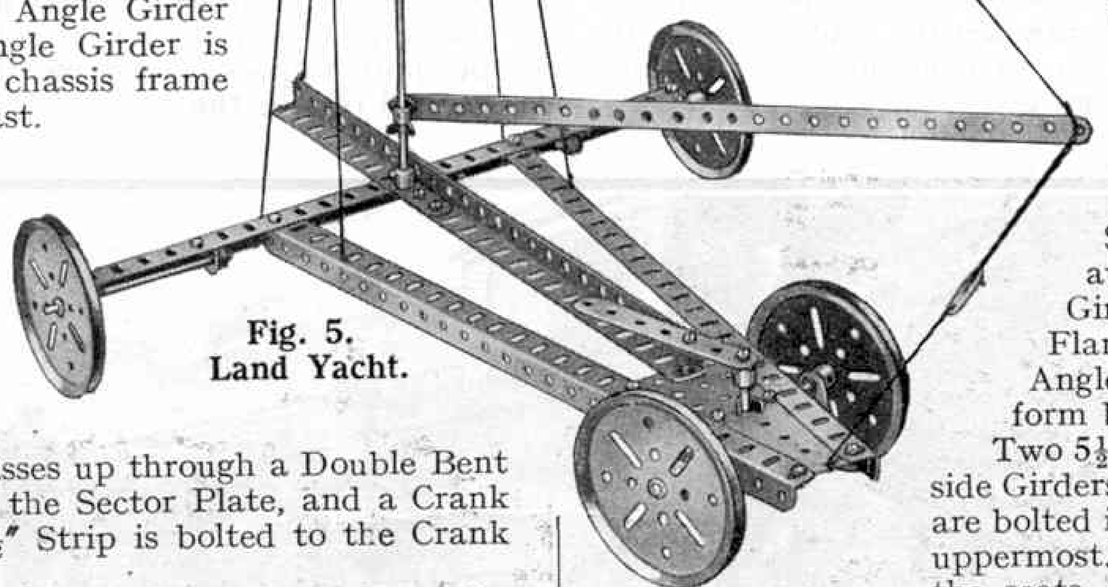


Fig. 5. Land Yacht.

The $11\frac{1}{2}''$ Axle Rod forming the mast is secured in the boss of a Crank bolted to the chassis, and the boom, a $12\frac{1}{2}''$ Strip, is pivotally secured to the mast by a bolt screwed into a Collar that is held in position by means of two Spring Clips. A nut should be placed on the bolt so that both Collar and Strip may rotate freely.

The parts used in the construction of the Land Yacht are :— 1 of No. 1 ; 1 of No. 3 ; 4 of No. 8 ; 1 of No. 10 ; 1 of No. 13 ; 3 of No. 15 ; 1 of No. 16 ; 1 of No. 17 ; 4 of No. 19b ; 1 of No. 24 ; 5 of No. 35 ; 19 of No. 37 ; 1 of No. 37a ; 1 of No. 45 ; 1 of No. 48a ; 1 of No. 54 ; 4 of No. 59 ; 2 of No. 62 ; 1 of No. 63 ; 2 of No. 111c.

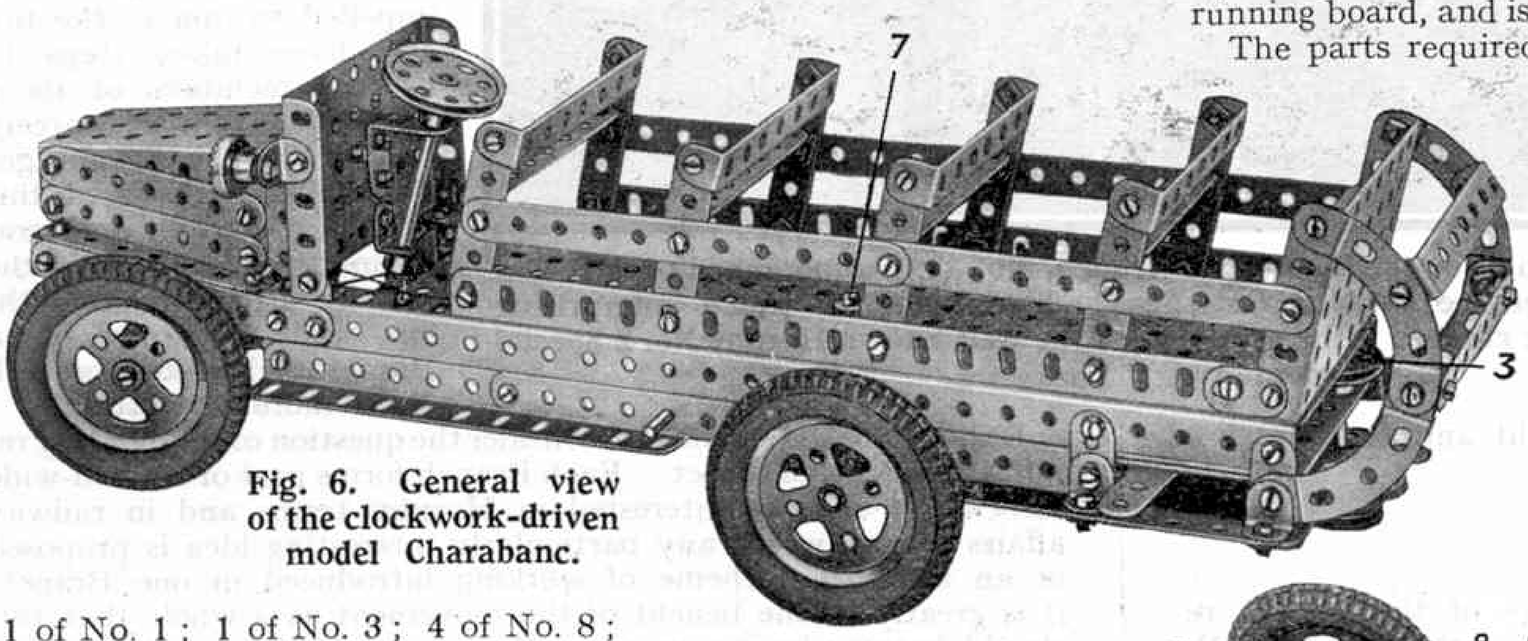


Fig. 6. General view of the clockwork-driven model Charabanc.

Charabanc

Motor vehicles are always popular subjects for model-building, and consequently the clockwork-driven Charabanc shown in Fig. 6 should be of interest to many readers.

The chassis of the model is built up from $12\frac{1}{2}''$ Angle Girders, which are extended at the front by $4\frac{1}{2}''$ Strips held together by a $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip.

The Clockwork Motor is secured to the sides of the chassis by means of two $5\frac{1}{2}''$ Angle Girders 8 (see Fig. 7), and the $\frac{1}{2}''$ Pinion on the Motor driving shaft engages with a 57-teeth Gear on the Rod 1. Two 1" Pulleys 2 and 3 are secured to each extremity of this Rod and are connected by cord to two Pulleys on the Rod 4. The jockey pulley 5, over which one side of the cord passes, is mounted on the Motor side-plate by a Flat Bracket and a $\frac{1}{2}'' \times \frac{1}{2}''$ Angle Bracket. The Rod 6, which guides the cord to and from the Pulley 3, is journalled at one end in the side of the chassis and at the other is a Collar secured to the floor by a Bolt 7 (see Fig. 6).

The model is steered by means of a cord passed four times round the lower end of the steering column and connected to each end of the $3\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip 9. The Double Angle Strip is pivoted at its centre hole to a $1\frac{1}{2}''$ Strip secured to the front of the bonnet or "radiator" by a $1'' \times 1''$ Angle Bracket.

The bonnet is formed from a Sector Plate and $3\frac{1}{2}''$ Strips secured at the front by means of a $1\frac{1}{2}''$ Flat Girder and at the rear to a $3\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate. A $1'' \times 1''$ and a $\frac{1}{2}'' \times \frac{1}{2}''$ Angle Bracket bolted to the Plate form bearings for the steering column.

Two $5\frac{1}{2} \times ''3\frac{1}{2}''$ Flat Plates are secured to the side Girders of the chassis and $9\frac{1}{2}''$ Angle Girders are bolted in position with their elongated holes uppermost. These Girders form supports for the seats, each of which consists of two $2\frac{1}{2}''$ Strips connected together by $3\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips. A Flanged Plate forms the back of the rear seat, and to this Curved Strips are secured. A Double Angle Strip is bolted between the Curved Strips, and a $2\frac{1}{2}''$ Strip is also secured in position by Angle Brackets. To complete the body-work, $5\frac{1}{2}''$ Strips are bolted to the $2\frac{1}{2}''$ Strips of the seats to form sides. A $5\frac{1}{2}''$ Angle Girder forms the running board, and is held in place by a Flat Bracket and $7\frac{1}{2}''$ Strip.

The parts required for the Charabanc are :—1 of No. 1 ; 1 of No. 1b ; 4 of No. 2 ; 2 of No. 2a ; 12 of No. 3 ; 1 of No. 5 ; 5 of No. 6a ; 2 of No. 8 ; 2 of No. 8a ; 4 of No. 9 ; 12 of No. 10 ; 21 of No. 12 ; 2 of No. 12a ; 1 of No. 15 ; 1 of No. 15a ; 1 of No. 16 ; 1 of No. 16a ; 1 of No. 17 ; 4 of No. 20a ; 1 of No. 21 ; 4 of No. 22 ; 1 of No. 23 ; 1 of No. 26 ; 1 of No. 27a ; 2 of No. 29 ; 112 of No. 37 ; 11 of No. 37a ; 4 of No. 38 ; 1 of No. 40 ; 1 of No. 48a ; 6 of No. 48b ; 2 of No. 52a ; 2 of No. 53 ; 1 of No. 54 ; 9 of No. 59 ; 2 of No. 77 ; 4 of No. 90a ; 7" of No. 94 ; 1 of No. 96 ; 1 of No. 96a ; 3 of No. 111 ; 3 of No. 111c ; 4 of No. 142a ; 1 of No. 160 ; Clockwork Motor.

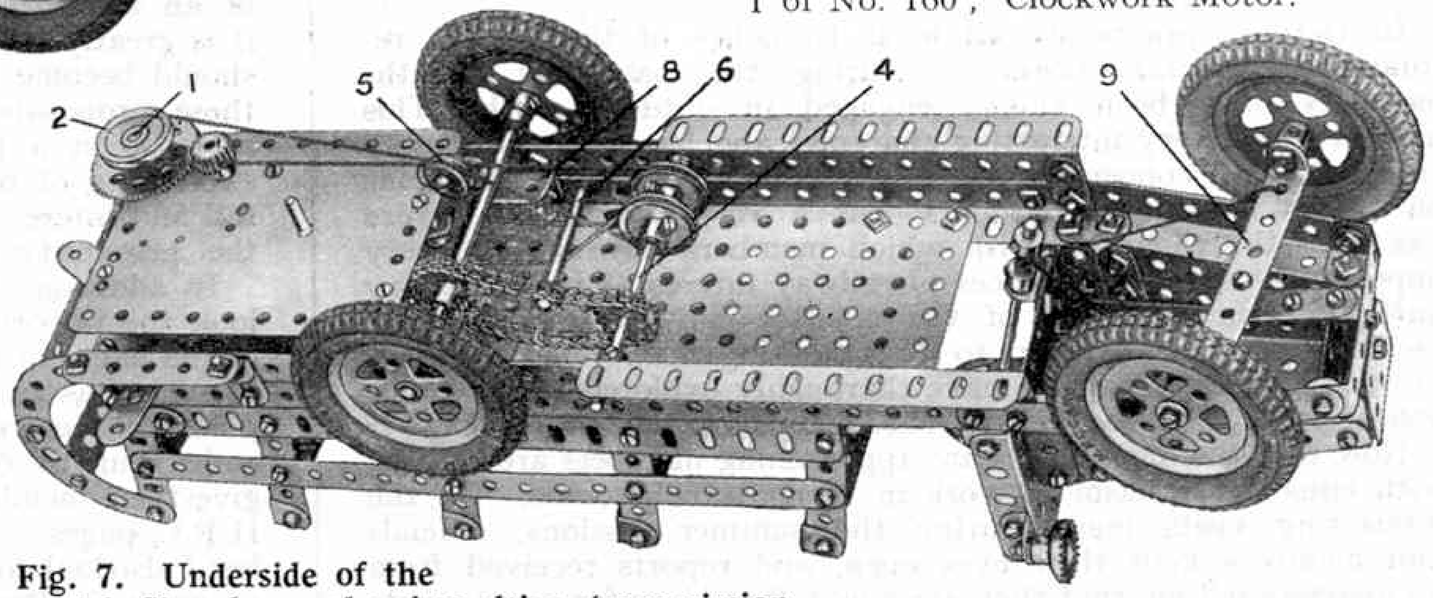


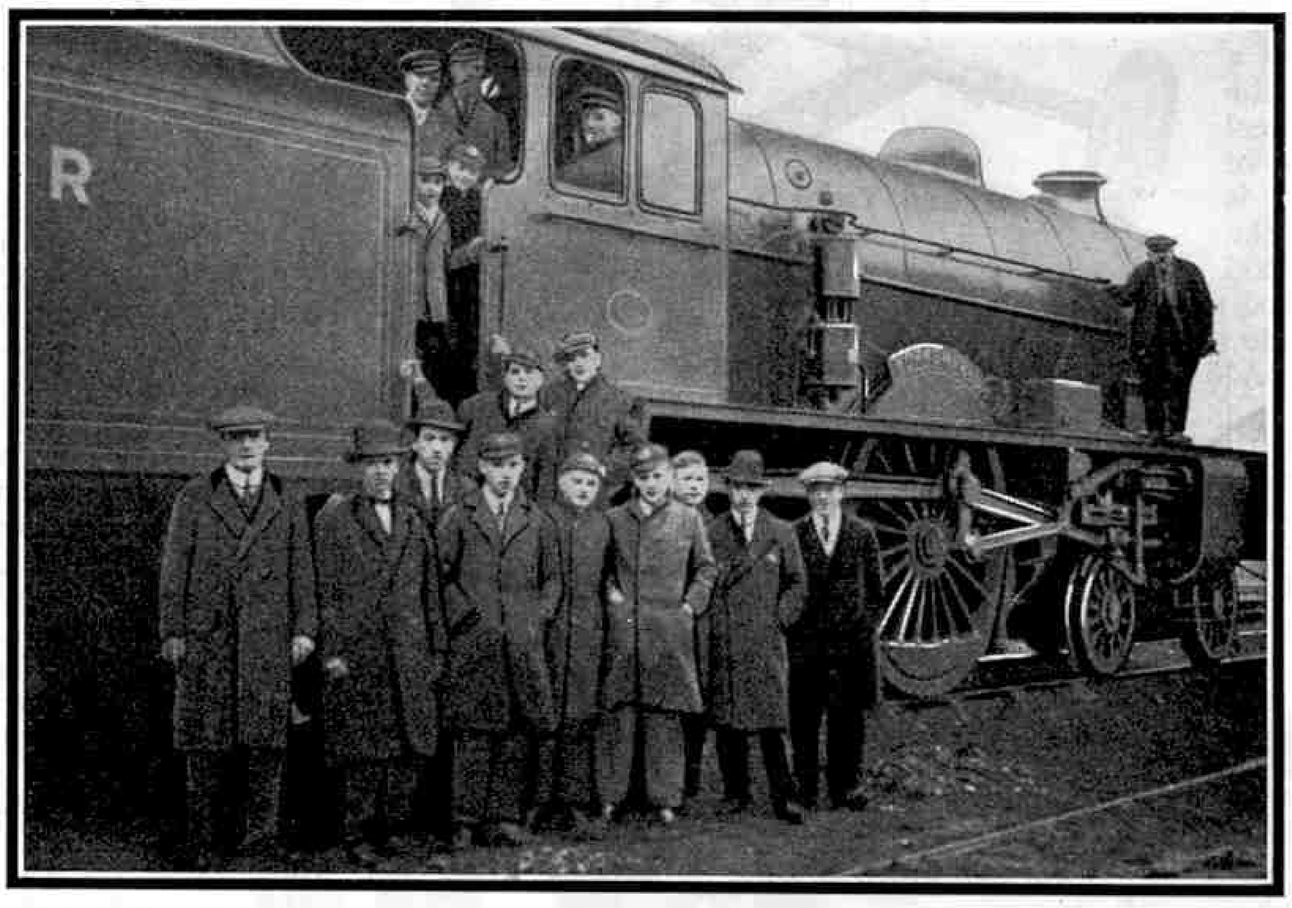
Fig. 7. Underside of the model Charabanc showing drive transmission.



Hornby Railway Company's Second Birthday

This month the H.R.C. celebrates its second birthday, and in view of this fact it may be interesting to review its progress since the first announcement of its formation was made in October, 1928. Membership quickly attained surprising proportions, and even after the first rush of enthusiasm had subsided the Company continued to grow at a very satisfactory rate. To-day there are more than 18,000 members in all parts of the world, and the continued success of the organisation is a proof that it has fulfilled the aims and objects with which it was launched. Needless to say, Mr. F. Hornby, the President of the Company, and the officials at Headquarters are keenly interested in its progress and are looking forward to an even more remarkable expansion during the next few months.

Undoubtedly the most gratifying feature of the growth of the H.R.C. is the spread of the local Branch movement. The chief aim of the Company is to enable Hornby Train owners to obtain the maximum amount of fun from their hobby. It is with this in mind that the formation of local Branches has been encouraged, for it is from the actual operation of trains on a large and realistic scale in association with fellow enthusiasts that the miniature railway owner derives his greatest enjoyment. The result has exceeded expectations. So thoroughly have members of the Company appreciated the idea that no fewer than 136 Branches are now incorporated with the H.R.C. In addition there are 263 Branches now in course of formation, and it is expected that a large proportion of these will qualify for incorporation at an early date. The prospects for the future are very bright and the winter of 1930-31 should be one of record progress.



Members of the Newcastle-on-Tyne Branch, No. 33, photographed on a recent visit to the engine sheds at Gateshead. The engine on which enterprising members have climbed is the prototype of the well-known Hornby No. 2 Special Locomotive, "*Yorkshire*."

Bright Prospects

In October practically all local Branches of the H.R.C. recommence regular meetings. During the past few months members have been chiefly engaged in outdoor work. This has been of a very interesting character and has been thoroughly enjoyed by all concerned. It has consisted largely of operations on tracks laid down outdoors, but a very prominent feature has been the eagerness with which members have seized every opportunity of visiting places of railway interest. Local railway authorities in all parts of the country have readily granted facilities to enable members to see something of the inner workings of our railways, and these have thoroughly explored the stations, goods yards and locomotive sheds thus opened to them.

Now that the dark nights are approaching members are turning with equal enthusiasm to work in their Branch rooms. On the interesting visits made during the summer sessions, officials and members kept their eyes open, and reports received from all quarters tell me that they are now full of ideas for new layouts or for introducing operations of a more novel or more impressive character. Everything points to very successful winter sessions, and I hope that every member of the H.R.C. will determine now to do his utmost to ensure this. He can do this by entering heartily into the programme arranged for his Branch, and also by endeavouring to interest at least one of his friends in the organisation, in order to increase its membership and strengthen its resources.

Regular Reports Wanted

I hope that during the coming months Branch Chairmen will do their utmost to see that a full account of the proceedings at meetings is sent to me at regular intervals, for otherwise it will be quite impossible for me to give adequate notice of the work carried on, on the page of the Magazine allotted to this purpose. The number of incorporated Branches is now very large, and in practically every case the programme is sufficiently interesting to enable really excellent reports of progress to be compiled.

The appearance of good reports of the proceedings of the Branches is of service in many ways. In the first place it helps to advertise the Branches themselves. There is no doubt that on reading reports in the "*M.M.*" of many interesting evenings that have been held by certain Branches, many Hornby Train owners have felt impelled to join in the fun and have taken steps to become members of those referred to. I need scarcely remark on the advantages that follow actions of this kind, for except in extraordinary circumstances the advent of recruits strengthens the resources of a Branch and makes its work even more interesting.

Branch officials should also consider the question of the monthly reports from a wider aspect. Each Branch forms part of a world-wide association of boys interested in Hornby trains and in railway affairs generally. If any particularly interesting idea is proposed or an attractive scheme of working introduced in one Branch, it is greatly to the benefit of the movement as a whole that this should become known in other Branches. If the members think these proposals suitable for their own circumstances they will then be in a position to put them into operation. Thus the experience of one Branch helps another and the publication of full and interesting reports is a very effective means of increasing the prosperity of the Hornby Railway Company as a whole.

In addition Branch Chairmen and secretaries should not overlook the importance of photographs. It is my desire to publish in the pages of the Magazine photographs of members of as many Branches as possible, and in view of the value of these from the point of view of publicity, the officials of each Branch should endeavour to obtain and forward good photographs and thus give their members the pleasure of seeing these reproduced in the H.R.C. pages. Ordinary group photographs are quite acceptable, but I also look forward to receiving others of layouts and of members at work in Branch rooms or engaged on interesting visits.

Branch Notes

BORDESLEY GREEN.—Recent activities have included an Exhibition, at which operations on the Branch layout were successfully worked to a timetable. Members have been divided into two sections—the Carpenters and Electricians. These have co-operated in fitting the Branch track on boards supported on trestles, and a non-continuous track specially adapted for timetable work has been laid down. A lecture on *"The Work of a Guard"* has been given by a gentleman interested in the Branch. Secretary: G. Gerrard, 86, Whitacre Road, Bordesley Green, Birmingham.

CHINGFORD.—Outdoor track meetings have been held during favourable weather, indoor work at other times including Competitions and Debates. In the latter the relative merits of L.N.E.R. and S.R. locomotives have been discussed. In these Debates the Branch collection of railway photographs proved very useful and interest was added by the inspection of other photographs. A business meeting opened the Autumn session, when plans for the coming months were made and officials appointed. More members are required and miniature railway owners desiring to join are asked to write to the Secretary. Secretary: D. G. Tucker, 31, Frederica Road, London, E.4.

LENTON SANDS.—In preparation for extensive operations during the winter months sections of the track have been re-laid and part of it electrified. The rolling stock also has been thoroughly overhauled and electric lights re-installed. Ingenious lamp posts have been constructed. These consist of pencils with the lead taken out, and they are fitted into wood bases. Small pea bulbs are used for the actual lamps and the necessary wires pass down the centre of the pencil. Fifty copies of the Branch magazine were sold during the month and efforts are being made to cope with a larger demand. Secretary: F. W. Byron, 125, Harrington Drive, Lenton Sands, Nottingham.

PLYMOUTH (ST. BARTHOLOMEW'S).—A very interesting outdoor track meeting was held, the layout used having a double track terminus, two sidings and a loop line. Meetings are held in the Chairman's house where a large permanent track is laid. At one meeting a discussion was held on merits and uses of the Hornby No. 1 Special Tank Locomotive and various Hornby Wagons. Secretary: S. T. J. Brenton, 53, Ford Hill, Stoke, Devonport.

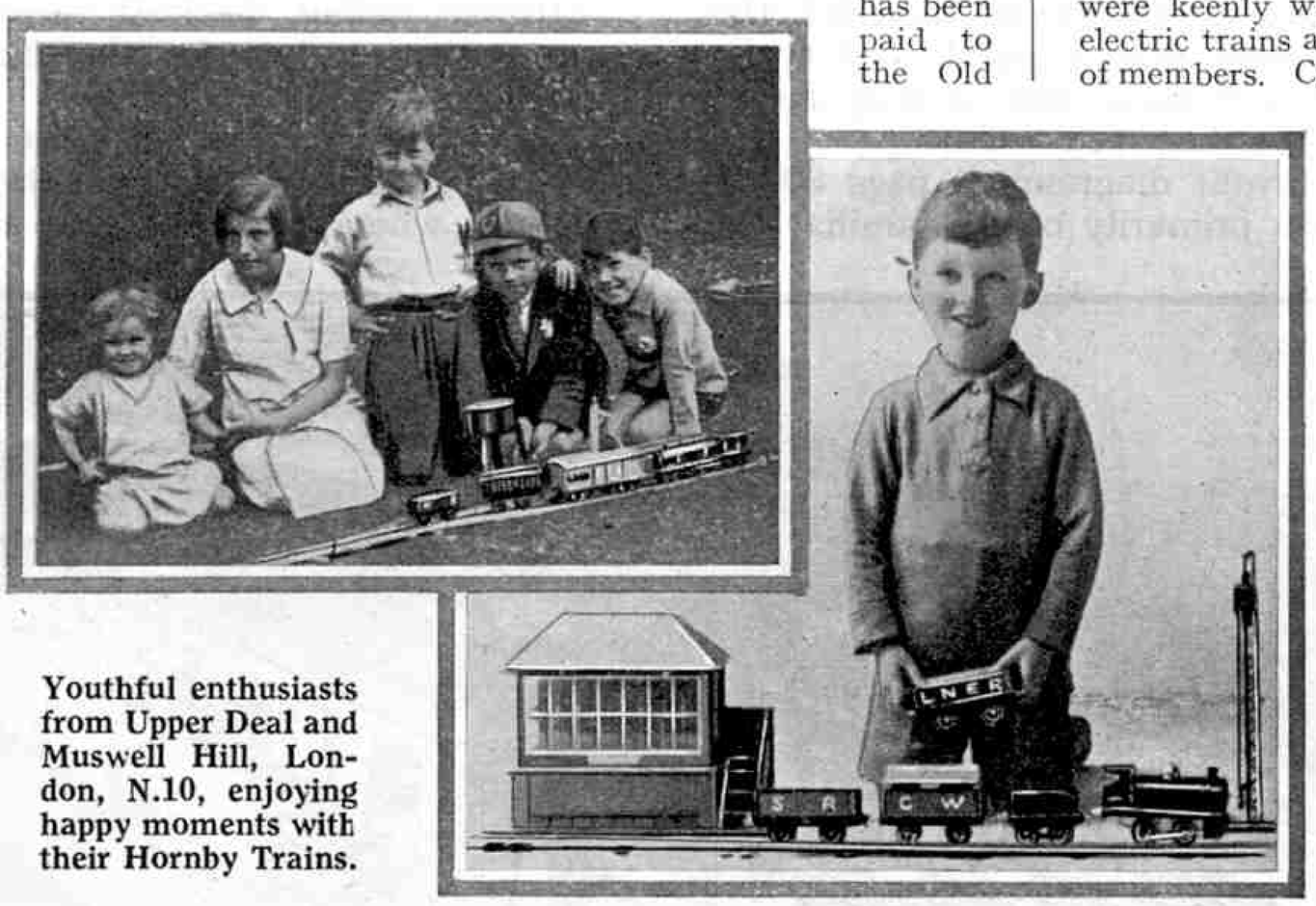
KING'S HEATH.—The Branch layout has been equipped with spacious sidings, on which interesting shunting work is carried out. Blackwell Station, at the summit of the Lickey Incline has been visited. There the banking engines are detached, and members were interested to see Nos. 1934-9, 0–6–0 T engines performing this work. A visit also has been paid by members to Avonmouth Docks. Secretary: K. Icke, 65, Livingstone Road, King's Heath, Birmingham.

SOUTH BIRMINGHAM.—Interesting additions have increased the attraction of track work. These include a complete signalling system operated from signal cabins, while the locomotive sheds have been provided with water towers and coal stacks, and loads have been arranged for the open wagons. Both the L.M.S. and G.W.R. operate in the Birmingham district and the layout therefore has been divided into two sections, one representing each company, on which trains are run according to timetable. The Photographic Section has been busy during cycling tours and visits paid to places of railway interest, and their prints will provide interesting matter for discussions at meetings during the winter. Secretary: E. Sharp, 156, All Saints Road, King's Heath, Birmingham.

NOTTING HILL.—A very interesting visit has been paid to the Old Oak Common Locomotive Sheds of the G.W.R., where members were shown round by one of the officials. They were greatly interested in Locomotive No. 6017, *"King Edward IV."* They climbed on the footplate of this engine and the functions of the various cab fittings and appliances were fully explained to them. Secretary: Mrs. H. A Sharp, 110, Cromwell Road, Notting Hill, W.11.

WEST NORWOOD.—Numerous interesting railway excursions included a visit to the S.R. locomotive No. E907, *"Dulwich,"* one of the "Schools" class, which was stationed at Herne Hill for two days. Locomotive sheds of the S.R. and G.W.R. also have been visited and interesting photographs of various engines have been obtained at several London termini. Secretary: G. W. Allison, 81, Stradella Road, Herne Hill, London, S.E.24.

NEWCASTLE-ON-TYNE.—The chief feature of recent activities was a very enjoyable visit to Liverpool, where the home of Meccano and Hornby Trains was thoroughly inspected. The long railway journeys were full of interest to members, who saw many types of locomotives and interesting station layouts. The Branch miniature railway is being extended, a second section now being constructed including nine stations, part of the track being electrified. An extensive and interesting programme of railway visits has been carried out. Secretary: John Fraser, 154, Fenham Hall Drive, Fenham, Newcastle-on-Tyne.



Youthful enthusiasts from Upper Deal and Muswell Hill, London, N.10, enjoying happy moments with their Hornby Trains.

OVERSEAS

SOUTH KOGARAH (AUSTRALIA).—In work on the Branch layout strict timetable working is followed. A complete round of operations is arranged to represent the work of one day, and after a break that of the next day is carried out. Through constant practice members in charge of the goods yard have become adept at fly-shunting. Outdoors a paper chase was held. This was exciting, for members taking part were asked to keep a sharp lookout for a car that had been stolen and abandoned in the district. Secretary: H. Walsh, "Bringa," 220, Prince's Highway, Kogarah, Sydney, N.S.W.

GEELONG (AUSTRALIA).—A very interesting visit was paid by the Branch to the Geelong Locomotive Sheds, where "coaling up" and "taking in water" were keenly watched. The new petrol-electric trains attracted the special interest of members. Colour light signals have been installed on the Branch track. Constructional work has been added to the programme and two locomotives, a 4–4–0 tender engine and an 0–6–0 tank engine are being built. Secretary: C. Aldridge, 65, Kilgour Street, Geelong, Victoria.

NELSON (NEW ZEALAND).—Timetable working is a regular feature of Branch work. Special attention has been paid to the track. This has been re-laid and is now of high calibre, derailments having been practically eliminated. During the football season a strenuous game preceded work on the track. Secretary: F. Curran, 9, Wainui Street, Nelson.

Further Branches in Course of Formation

The following new Branches of the Hornby Railway Company are at present in process of formation and any boys who are interested and desirous of linking up with this unique organisation should communicate with the promoters, whose names and addresses are given here. All owners of Hornby trains or accessories are eligible for membership and the various secretaries will be pleased to extend a warm welcome to all who send in their applications:—

BIRMINGHAM—E. Neep, 104, Sandford Road, Moseley, Birmingham.
CARDIFF—J. S. Campbell, 2, Stallcourt Avenue, Pen-y-Lun, Cardiff.
EDINBURGH—D. D. Young, 27, Nile Grove, Edinburgh.
GODALMING—D. H. A. Huddart, The Retreat, Chalk Road, Godalming.
GREENFORD—C. Howe, 145, Costons Lane, Greenford, Middlesex.
ILKESTON—F. Caddick, "Woodthorpe," Catherine Avenue, Ilkeston, Derbyshire.
INVERNESS—Mr. H. A. Lane, 1, Carlton Terrace, Millburn Road, Inverness.
LONDON, S.E.23—R. A. Davies, 92, Dacres Road, Forest Hill, London, S.E.23.
ODIHAM—A. A. Verstage, Post Office, Odiham, Hants.
SOUTHAMPTON—Victor P. Tami, 15, Trinity Road, Southampton.



Hornby Railway Company

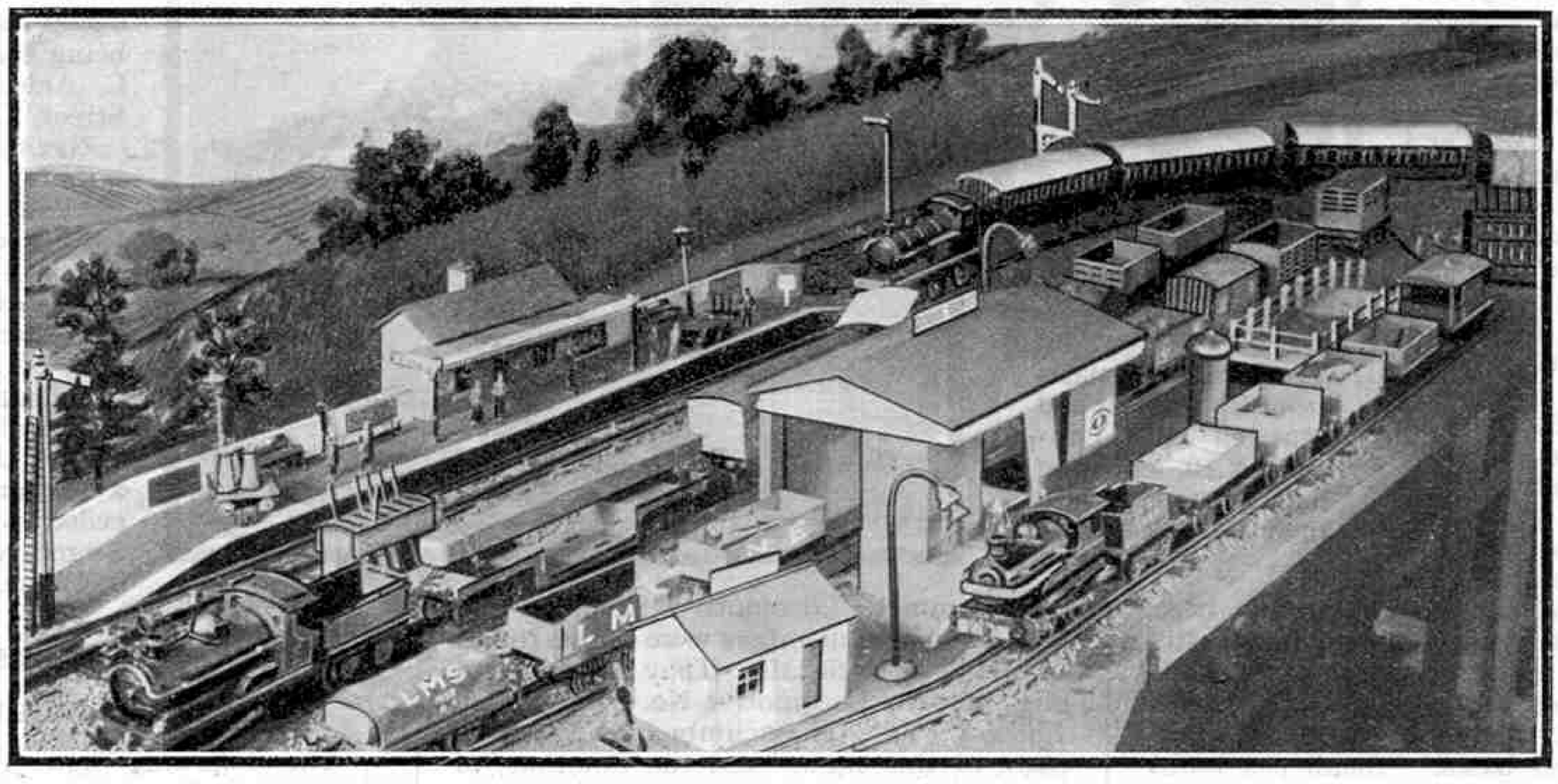
JUNIOR SECTION

XXII.—Signals on a Simple Layout



LAST month we dealt generally with the use of signals on miniature railways. We described the special purposes of the different types of signals and their positions in relation to the tracks to which they refer. We now propose to take a simple but typical and interesting layout and show how it may be signalled on the lines described last month.

If we examine the layout diagram on page 805 we shall see that it consists primarily of the familiar oval track, with a single passing station. In order to elaborate this plan an engine shed has been introduced at one corner and goods sidings are included in another corner. The chief scheme of the line is traffic of a local character, including the carriage of a certain amount of goods. The locomotives employed are of the tank type, which do not require to be turned, and therefore enable us to do without a turntable. Traffic is intended to be worked in both directions on the layout, and therefore a passing loop has been incorporated at the station. A small carriage siding joins up with the main line and runs partly behind one of the platforms. On the other side of the layout a tunnel is shown to add variety, but if the model railway owner does not like this idea, a bridge, viaduct, or another station might be placed here just as well.



A country station and goods yard on the miniature layout of Mr. C. F. Rhys, Salisbury. Control of the various signals is afforded by the two lever frames shown. This layout is a fine example of the realistic possibilities of a scenic background.

Last month we mentioned that the use of "distant" signals often introduces complications, but in a simple layout of this character there is sufficient room for them to be used in the correct manner. We have therefore included "distant" signals as well as the usual "home" signals. The signal-box at the station has been placed at the head of the small goods yard in order to give the signalman a clear view of all that is going on under his charge.

In order to see exactly how the various signals are used, and what purpose each one serves, we will imagine ourselves to be on the footplate of a locomotive that is about to leave the shed to fetch its train from the carriage siding, back it into the station, and then start the services for the day. All the signals are in their normal or "danger" position, and the engine is allowed to proceed, with the permission of the signalman, on the wrong line over the crossover, and so to the siding where the coaches are stored. The siding starting signal is then lowered and the train is drawn gently out and along to the advanced starting signal, which is placed about a train length ahead of the points. We then back into the station, and after waiting to pick up passengers and luggage we see that the station starter is pulled off for us, and we commence our journey round the main line.

We soon come to the advanced starter, which also is "off"; and then with our engine getting well into its stride we catch sight of the "distant" signal that shows us whether the "home" signal governing the entrance to the long tunnel will give us a clear road or not. Fortunately we find the "distant" signal "off," and we are therefore able to proceed at a good speed until we come to the signal at the tunnel mouth, which also we find in the "off" position. From this indication we know that the road is clear through the tunnel as far as the next "home" signal.

The signal at the tunnel mouth probably will have a sighting screen placed behind the semaphore arm, as described last month, in order to show up the arm clearly against the blackness of the tunnel.

Passing quickly through the tunnel we are soon in daylight again, and immediately we catch sight of the next "distant" signal, which unfortunately is at danger. This warns our driver that in all probability

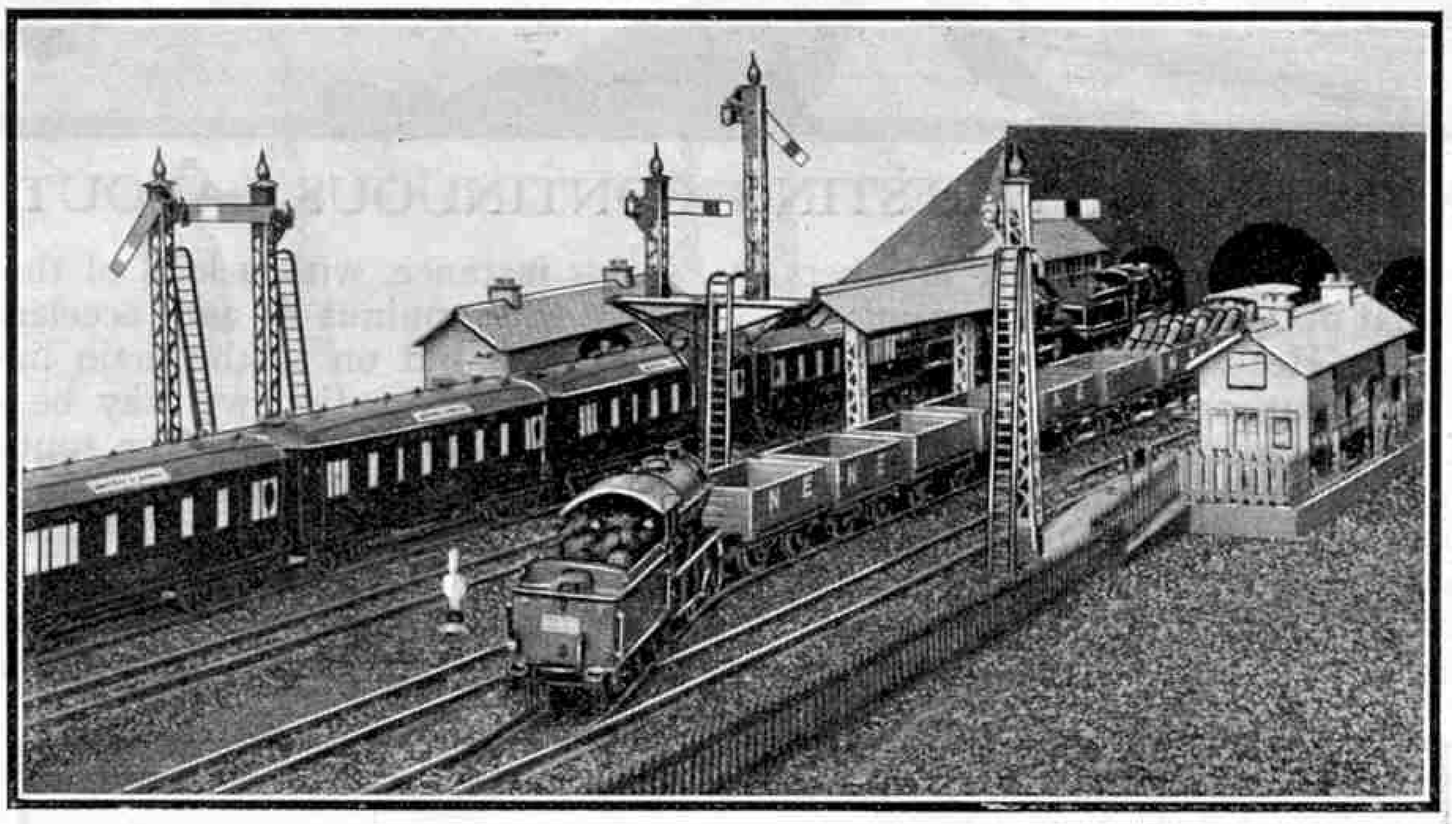
the next "home" signal will be at danger, and that he must reduce speed so as to be prepared to stop at the "home" if it proves to be against us. The reason for the check is that another locomotive has been carrying out marshalling operations while we have been traversing the main track, and has been occupying part of the main line and using it as a shunting spur. These operations are completed just in time, however, and as we approach the station "home" at reduced speed we are glad to find the arm dropped to the "all clear" position.

Accelerating slightly we round the bend, and soon we come to a standstill once more in the station.

The main line is single track and the only passing place available is at the station. Therefore, in order to enable the goods train that has been assembled to make a circuit in the opposite direction, the passenger train must wait at the platform until the goods train has completed its trip. We are given the "right-away" by the station starting signal at the end of the platform. Although it is possible to make a choice of two roads, only one signal arm is provided; because the straight road leads only to the sheds, and in order to avoid unnecessary complications this road is not signalled. Care is always taken, of course, by the enginemen to see that the line is clear before they proceed to the road leading to the shed.

We gain the main line, and our journey is exactly the same as the one we took on our previous trip with the passenger train. On emerging from the tunnel, however, we pick up the "distant" beyond, which shows "line clear," and we know that the next "home" signal is also favourable. The next signal after this has two arms upon it, one above the other, the upper one being the "home" signal and the lower the "distant." If we are to pass through the station without stopping, both these arms will be "off," provided that the road is clear. As we are to stop, however, and to pick up one or two trucks and possibly drop others, the "home" signal shows "clear," giving us the right of way on to the left-hand platform line, but the "distant" signal remains at "danger," so that we shall be held at the station starting signal. As soon as our train has cleared the points where the single line opens out into the double station tracks, the passenger train that has been waiting for us to clear the single line takes its departure.

After the passage of the two trains that we have accompanied round the main line, the signals should have been returned to the normal or "danger" position. Thus on our arrival on the goods train, before the station starter is pulled off to allow the passenger train to proceed, the "home" arm of the double arm signal that admitted us to the station should have been put to danger. If this were not done these two signals would be giving the right of way in opposite directions over the points, and this would, of course, be unsafe working. A moment's examination of the layout diagram will make this clear. In real railway practice the giving of conflicting signals is prevented by what is known as the "interlocking" of the levers in the signal cabin. This interlocking makes it impossible to move the levers in such a manner as to bring about dangerous possibilities, and the signalman is obliged to operate his levers in a certain order that as far as possible ensures complete safety. Such a method is not possible with the signalling equipment found on most miniature layouts, but the principle of "safety first" should be carefully observed.



Signals on a busy four-track section of a Hornby layout. A goods train partly loaded and partly empty crosses from the inner to the outer track, the junction signal giving the necessary indication. The movement is protected by the station starting signal at "danger," so that no train can leave the platform, and cause a collision.

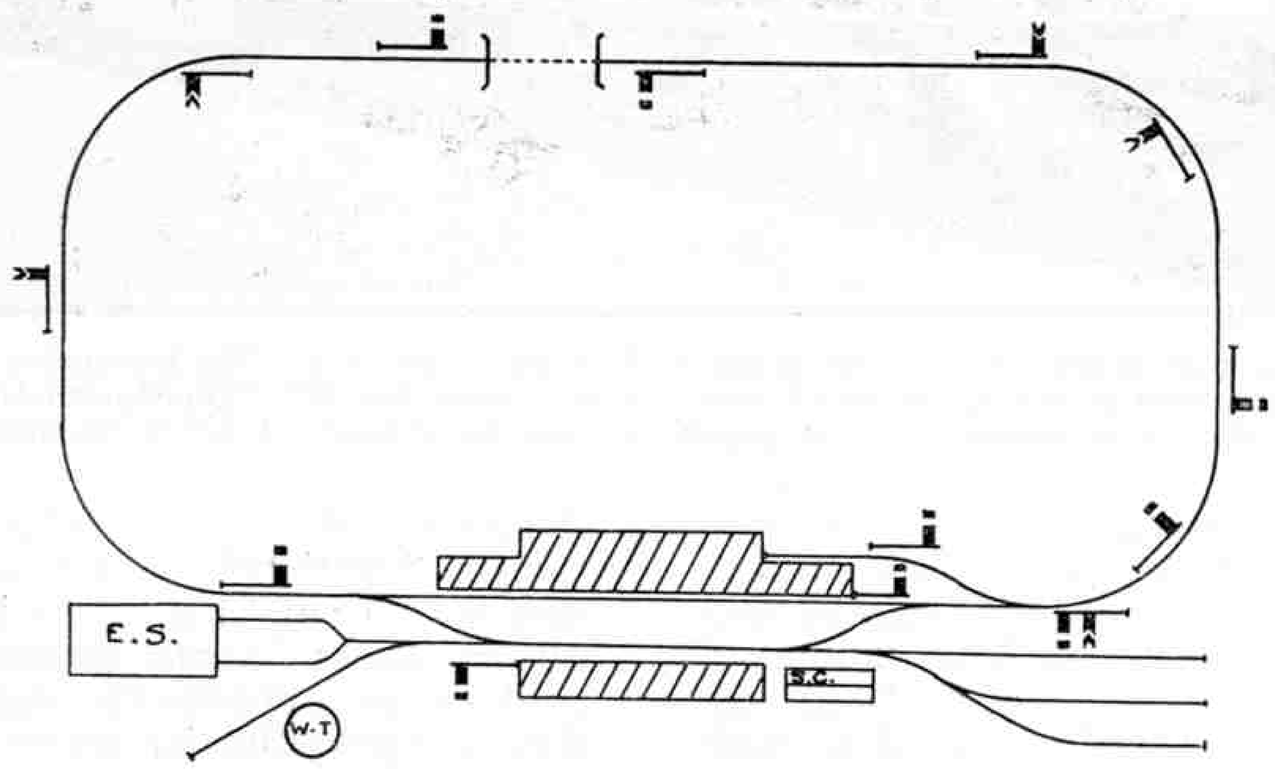


Diagram of the layout described in this article showing the position of the various signals.

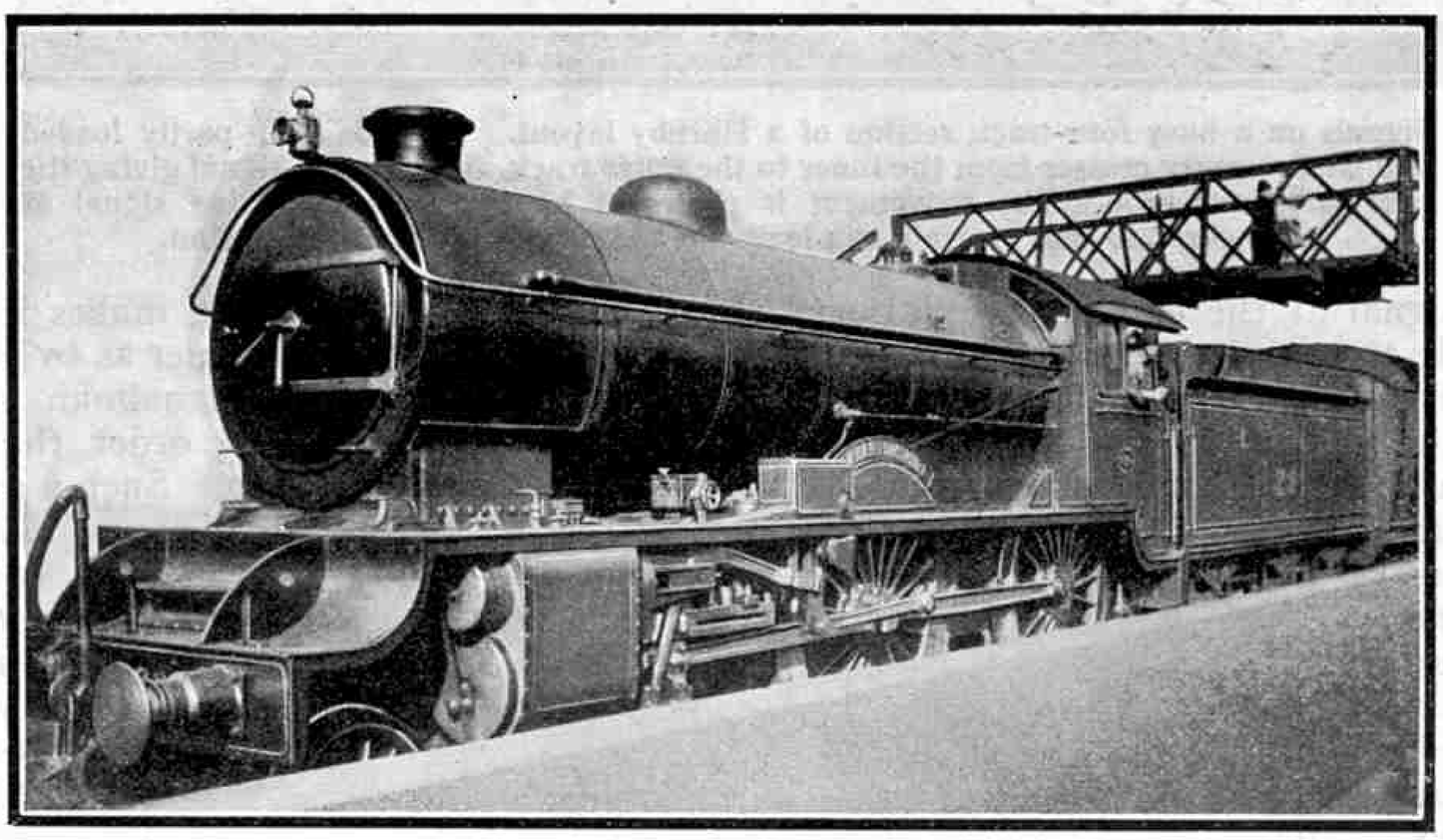
The layout as shown will carry about as much traffic as a single operator can conveniently manage. While he is dealing with the goods operations, the passenger train may be left to its own devices; and if the capabilities of the engine are known and the requisite number of turns of the key are given on winding, the train will draw up as required at the platform after one or more circuits of the track. When two operators are available an additional station with passing loop and if necessary sidings, may be installed in place of the tunnel. Additional signals to act as station starters will be required, the existing "homes" that guard the tunnel entrances becoming the station "home" signals. In this case the signalling control might be divided between the two operators, each having his own section and lever frame governing the signals (*Continued on page 840*)



XXIV.—AN INTERESTING CONTINUOUS LAYOUT

ONE of the many advantages enjoyed by members of the H.R.C. is that of being able to communicate regularly with the Headquarters staff on all matters affecting the planning and operation of their miniature layouts. In large numbers of cases regular correspondence is carried on between Headquarters and members. Proposals for the extension and development of layouts are submitted for criticism and suggestion, and members send in diagrams and descriptions of model railway schemes that they have developed in accordance with suggestions put forward from time to time in the H.R.C. pages of the "*M.M.*"

The layout shown on page 807 has been developed as a result of the layouts that were shown in the May and June issues of the "*M.M.*" It is the outcome of correspondence between the Headquarters staff and M. Wormald, an H.R.C. member, and the latter's track will ultimately take a form practically identical with that shown in the diagram. The layout offers considerable scope in regard to interesting train working. It consists primarily of two oval-shaped tracks connected to each other at their ends, the actual formation at these points being triangle junctions. Inside the larger oval is the terminus station, complete with sidings, engine shed and turntable.



A fine photograph taken by our reader C. McLean of Ayr, N.B. The locomotive will be recognised as one of the well-known "Shire" class, No. 281, "*Dumbartonshire.*" This class is the prototype of the popular Hornby No. 2 Special L.N.E.R. locomotive.

It will be of interest to detail a few of the great variety of train operations possible on the layout. Locomotives of several kinds, both tender and tank, may be employed, as the layout is equally well adapted to main line long-distance express working and to short-distance residential and suburban traffic. Trains may depart from the terminus and reach their destination—which on this layout is the arrival side of the same station—after performing a variety of movements in accordance with working timetables or the wishes of the operator.

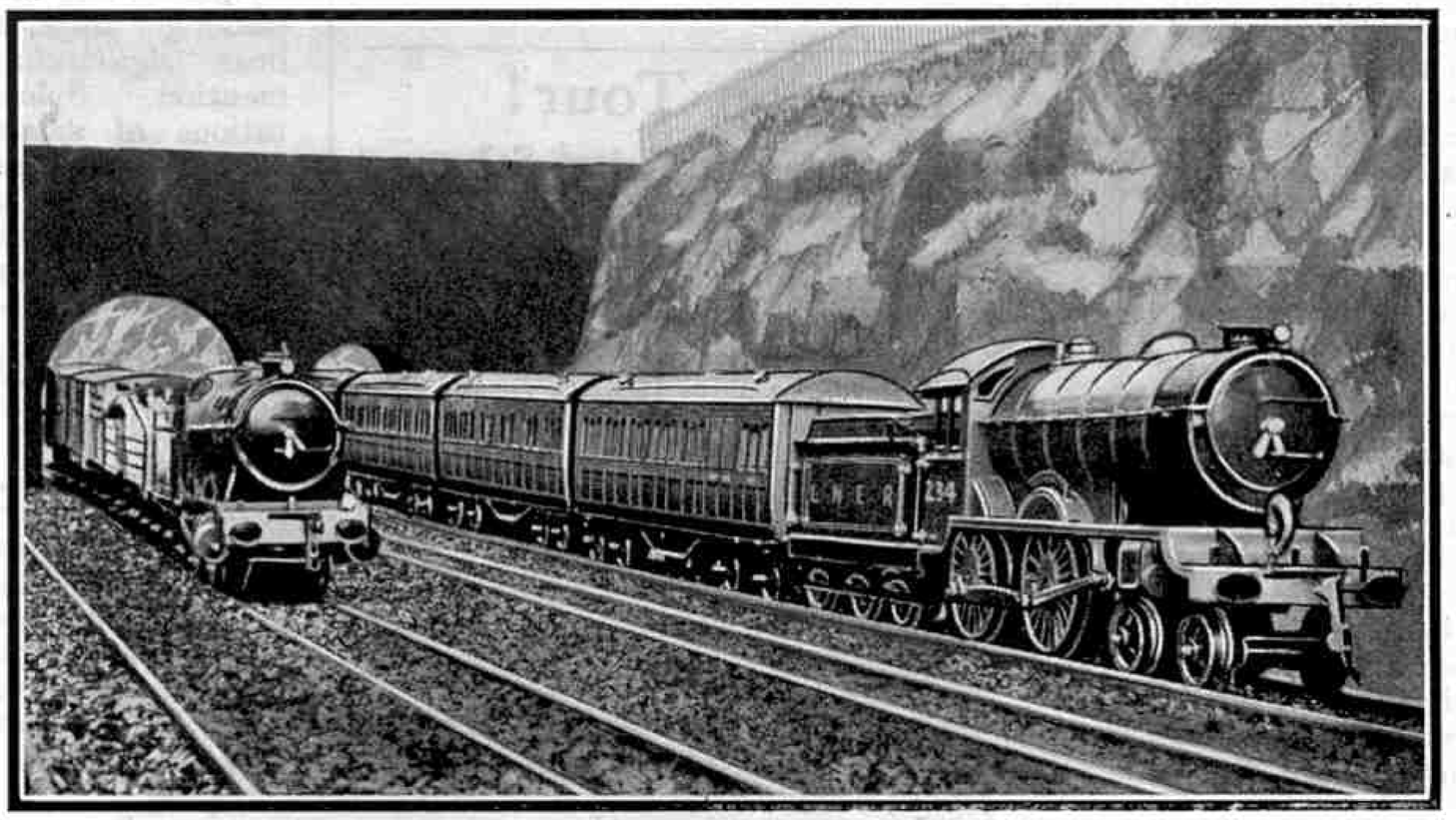
For instance, with a load of three Pullmans we may leave the terminus A, and, accelerating past the engine shed, pass out on to the main line. On approaching the triangle junction we may be signalled to take the right-hand line, which is the route to station B. We do not stop here, but pass straight on, and soon another triangle junction comes into view. We are again switched to the right, and having negotiated the curve with due caution we settle down to a good spell of high-speed running. Approaching the first triangle for the second time we head straight on, and after rounding a curve we see station C come into view. We now reduce speed and presently come to a stand at the platform, when a brisk exchange of passengers and luggage occurs.

Promptly we are given the "right-away," and soon we are into speed again. Swinging to the right over the triangle we fly past station B, taking the left-hand road at the next triangle and so continuing along the high-speed stretch of line that we have previously negotiated in the opposite direction. This time we do not stop at station C, but pass through without slackening and continue to maintain our speed until we are opposite the engine shed of A terminus. Here a speed reduction occurs. We take the left-hand points leading to the terminus, now our destination, and with another left-hand turn just opposite the station, we draw slowly in on the arrival side. Now the locomotive is uncoupled and run forward clear of the crossover. The points are then pulled over and the locomotive backs down the departure line and so to the turntable where it is turned ready for another trip.

If the coaches are required to form another train to leave shortly, they will be drawn out by a small tank locomotive, doing duty as a station pilot, and then backed into the departure road ready for another trip. If they are not required for an outgoing train they

will be disposed of by shunting them into the adjoining carriage sidings.

Many other variations in the road taken by our train may be made. For instance, various possibilities are suggested by reason of the fact that the layout consists of two sections—the upper oval on which is station C, and the lower one upon which is station B, and which contains the terminus A. The line through B is of course common to the two sections, and great fun is to be had by arranging "paths" for different trains along this strip of line between the two triangles. Let us suppose that two trains are approaching the double symmetrical points where the two sides of the triangle converge; then one, the less important, will be checked, and the other will be given the road ahead. Thus a suburban stopping train would be held to provide a clear path for an express; and similarly a goods train would give precedence to a passenger train. Smart working will be necessary in order to keep the trains to their allotted paths, for one train may make more stops than another and this will allow the non-stop train to get ahead. Then again, two trains in opposite directions may be offered to the operator at station B at the same time, and he then has to decide which is to get the road first.

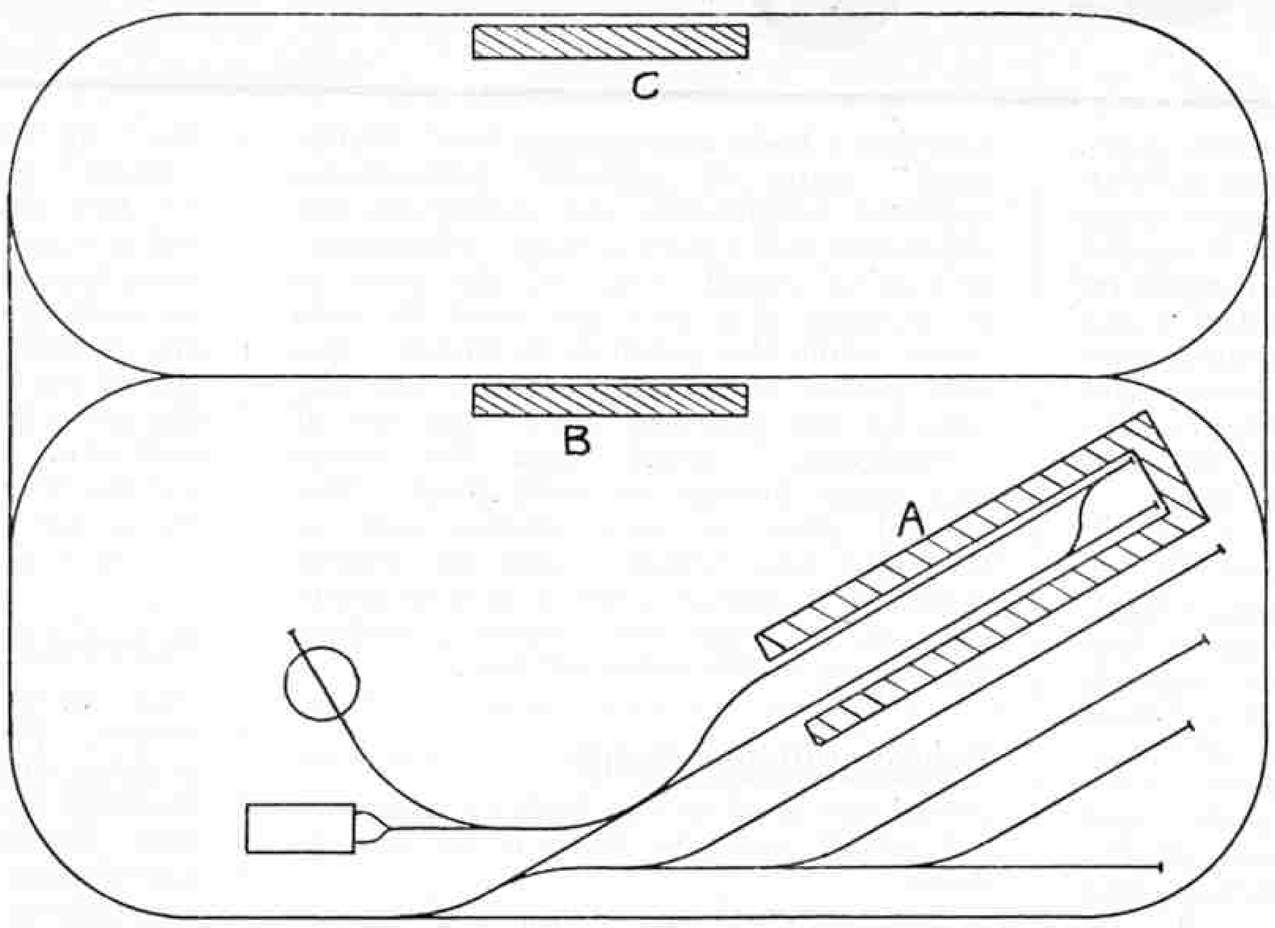


Part of a four-track section of a Hornby Layout, showing a stopping train headed by a No. 2 Special locomotive, "*Yorkshire*," passing a No. 1 Special locomotive hauling a fast goods train. The line at this point runs in a deep cutting through rock, and the realistic effect of the arched bridge is a feature.

An extremely fascinating method of working for this section that might be experimented with by enthusiasts who are keen on realistic details, is train working on what is known as the "staff" system. In real railway practice a staff is a bar of wood or metal that is handed by the signalman to the driver of a train working on a single line section. The staff is the driver's visible authority to be upon the line, and it is given up by him to the signalman on reaching the other end of the section. As there is only one staff to each section, only one train can be authorised to occupy that section at one time, and in this manner safety is assured. On our system the train that is given precedence over what we may call "B section" may carry the staff to show that it is authorised to be on the line. The staff is given up at the end of the section, and the train waiting there to proceed will then take it back to the point at which the first train received it.

On a Hornby Railway a Meccano 1" rod may be used as a staff or alternatively Meccano washers may be employed. They may be carried in the tender of the locomotive so that they cannot fall off and yet can easily be extracted when it is necessary for the signalman to take charge of them. In actual practice of course there is further elaboration of the staff system just described but we need not concern ourselves on this point for the working of our Hornby layout. The relatively simple method that we have dealt with will be quite sufficient for the working of the traffic.

In some cases the staff or its equivalent is picked up or set down at speed. This is especially so on the Highland section of the L.M.S. where there are long stretches of single line broken only by occasional passing places. Here the automatic picking up of the staff for the next section and the dropping of the one for the previous section is accomplished by ingenious apparatus at quite high speeds.



The layout mentioned in this article, upon which a number of interesting operations may be conducted.

The reproduction of such apparatus might provide a chance for H.R.C. members to exercise their ingenuity, and we shall be glad to hear from any who are successful in this direction.

As a number of readers may desire to instal a layout somewhat similar to that shown in the diagram we think that details of the method of laying out the triangular junctions would be useful. A Double Symmetrical Point of either right-hand or left-hand pattern has a single curved rail attached to each diverging arm. The quarter circle is completed in each direction by the curved portion of a Left-Hand Point in one case and a Right-Hand Point in the other. Two and a quarter straight rails fill up the space between the Right and Left-Hand Points. These junctions can only be made up with 2 ft. radius rails.

Mechanical Wonders—(*Continued from page 775*)

mathematical symbols, enables mathematics to be learned by a blind child in an ordinary sighted class.

Blind people are even more enthusiastic about broadcasting than those who have sight, but until recently it has been out of the question for the average blind person to attempt to make his own receiving set. Now a method has been produced by which a blind person can make a wireless set entirely unaided, and know exactly what he is doing at every stage. The method has been evolved through the co-operation of French wireless apparatus manufacturers and the American Braille Press. The manufacturers supplied a skeleton frame, the dials of which were marked with raised letters. The difficulty of conveying instructions in regard to wiring was a serious one, for these instructions had to be much more elaborate than those required by people who can see and follow printed diagrams. After much experimenting a complete diagram in relief was produced to guide the blind person in carrying out the wiring and other work, in addition to the ordinary instructions printed in Braille.

Finally there may be mentioned an improved form of typewriter for the blind. Such machines have been in use for a number of years, but they have suffered from the drawback of requiring a roller, which rendered it impossible to make corrections because turning back the roller flattened out the dotted printing and spoiled the page. Another drawback to the earlier machines was that they printed only on one side of the page, which was a serious matter because Braille print takes up about five times as much space as ordinary type. In the new machine the roller is replaced by a frame of two metal bars at right-angles to the carriage. The keys pass along the frame, which is fitted with a special spacing device. When the page is typed on one side the frame can be turned over and type printed between the indented lines made on the other side. A further improvement is the use of a pendulum as the motive force, instead of a spring, which is troublesome in machines for the blind.

The Swashplate—(*Continued from page 795*)

and one at a dead-point with valve closed. The motor runs at a constant speed, but the volume of water transferred depends on the tilt of the swashplate. Reversal of the tilt reverses the direction of transference of the liquid. Note the very elaborate ball-bearings, roller-paths, and thrust-block, designed to absorb all the rolling, endwise, and oblique thrusts with as little friction as possible.

The "B" end of the system, where the hydraulic pressure is re-converted into rotary motion, is shown in Fig. 3. Here again, but with a different form of valve gear, we have one group of valves open to the one main and the second group to the other, so that the rams on one side are forced out and those on the other sucked in, their combined effect causing the swashplate to turn in its bearings.

(*To be continued*).

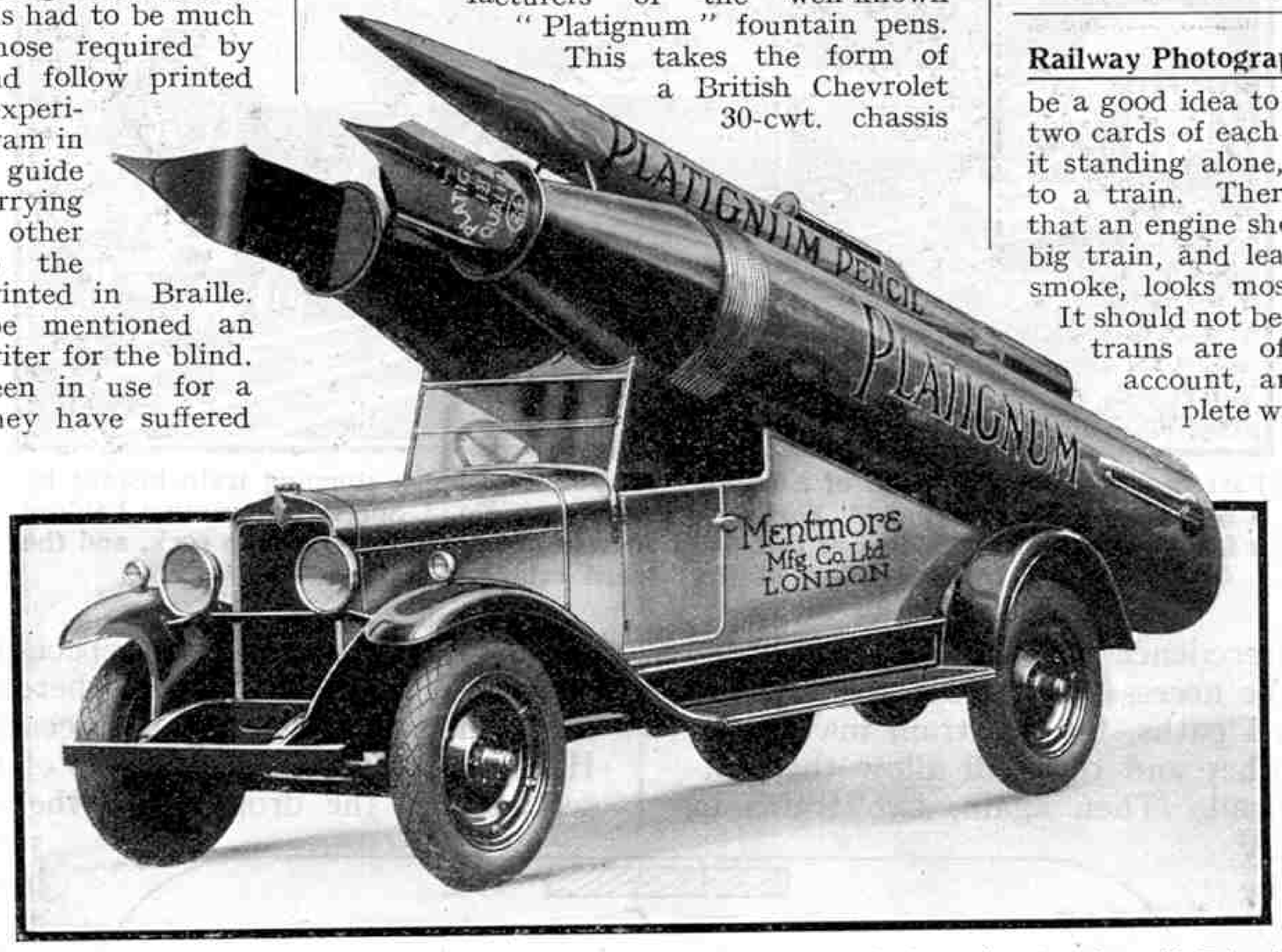
Largest Transformers—(*Continued from page 755*)

the inert gas nitrogen, with the object of preserving the insulating qualities of the huge coils in the absence of the oil during the journey. The tanks were then loaded on to specially built wagons of the well type. These were huge twelve-wheeled vehicles of enormous structural strength, in which the well portion was carried down to the utmost possible depth in order to obtain the necessary clearance under the various bridges that cross the line along the route.

Pens on Tour!

An Ingenious Publicity Scheme

An ingenious method of publicity has been adopted recently by the manufacturers of the well-known "Platignum" fountain pens. This takes the form of a British Chevrolet 30-cwt. chassis carrying a body representing two "Platignum" pens of gigantic proportions, mounted lengthways and supporting between and above them a giant "Platignum" propelling pencil. One of the pens is in mottled blue and the other in jade green, while the pencil is in amber. The side panels and bonnet of the car, the nibs of the pen and all fittings are of "Platignum" metal, and the wings and under fittings are solid black. The general effect is very striking and at the same time artistic; and the vehicle is bound to attract a great deal of attention as it tours the country, making an average of 100 miles per day.



Holidays with Gamekeeper—(*Cont. from p. 771*)

jerked his head in the butler's direction. "I wasn't going to leave it for him to drink."

The last time I saw Alan he was married and beginning to look careworn and elderly. But it was soon obvious that he yet retained interest in his work and, to judge from his loaded vermin pole, his hand had not lost any of its cunning. Boys, too, still were attracted by his wonderful familiarity with bird and animal life, and another generation of them trudged to and fro with him, as absorbed in his interesting employment as I myself had been when young.

Scale Models of Steamers

Scale models are always fascinating, but we must confess to a more than ordinary degree of interest in the range of "waterline" models that have been put on the market recently as a new venture by Messrs. Millars' Marine Models, of 114, Howard Street, Glasgow.

The models all are built to a scale of 1 in. to 50 ft. and range from a tiny 4-inch model of the old Clyde paddle steamer "*Juno*" to 16-inch reproductions of great passenger ships, among which the Cunard liner "*Aquitania*" is deserving of special mention. Splendidly realistic representations of steamers owned by British railway companies also are noteworthy.

The makers will be pleased to send full details and prices to any reader who writes mentioning the "*M.M.*"

Railway Photographs—(*Continued from page 765*)

be a good idea to have, wherever possible, two cards of each locomotive, one showing it standing alone, and the other attached to a train. There is no doubt, however, that an engine shown tearing along with a big train, and leaving behind it a trail of smoke, looks most like the "real thing."

It should not be forgotten also that many trains are of interest on their own account, and no collection is complete without photographs of the "*Flying Scotsman*," "*Cornish Riviera*," "*Royal Scot*," and other famous expresses. A word of warning should be given here regarding the collecting of train photographs. These should not be ordered from the name of the train without considering the type and name of the locomotive hauling it. Suppose, for instance, you were to order photographs of the "up" Birmingham express and the "down" Scottish express on the L.M.S. No two titles could seem more varied, but it is probable that you would find the same type of engine—a 4–4–0 compound—on each train. Again, you might order one of the "*Atlantic Coast Express*" and one of the "*Southern Belle*," and find that the same type of locomotive was hauling each one. By considering the engine first and the train second you will avoid collecting a number of train photographs with similar types of locomotives.

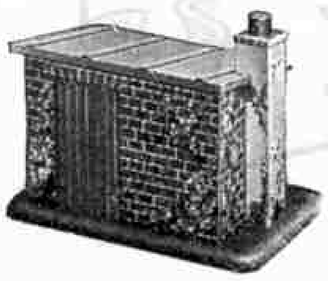
Miniature Airships—(*Continued from page 783*)

ready to begin training in the control of blimps. He is given practical experience in flying dirigible airships and also gains a thorough knowledge of the theory of flying. This includes aerodynamics, navigation and wireless operating in addition to airship and balloon control and maintenance, and every pilot also must be fully conversant with the internal combustion engine. Knowledge of these subjects is tested by a severe examination. Meteorology also is very important, and it is interesting to note that the complete training course is spread over a period of six months in order to give students experience in flying during weather of all kinds. At the end of the course a student may apply for a license as a fully qualified pilot.

Recent Additions to the Hornby Series

By "Tommy Dodd"

WITH the advent of the Autumn and Winter months the thoughts of model railway enthusiasts turn again to the pursuits of their favourite hobby after this has perhaps been neglected, in some degree at least, during the summer. Plans are made for the extensions of the layout that will probably occur, the equipment as a whole is overhauled and put into good working trim, while additions to the rolling stock and accessories are considered as a matter of course. No less busy in this direction are the Branch Secretaries and in order to assist them and their members in general a few remarks on the latest products of the Meccano Factory in the way of Hornby material will probably not be out of place.



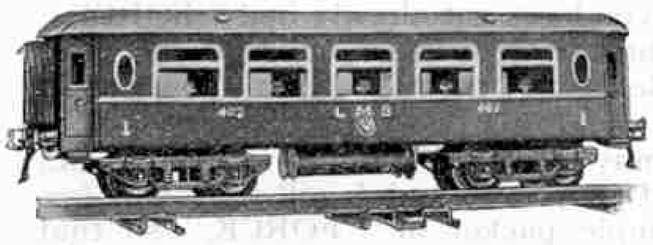
Hornby Platelayer's Hut.

Many demands have been received during the past twelve months for the fitting of electric motors to the popular No. 2 Special Locomotives. Readers will, therefore, be pleased to hear that electricity as a motive power has been applied to the tank locomotive of this series, and this model is known as the Hornby No. 2 Electric Tank Locomotive. The result is a particularly massive and powerful engine well adapted for heavy duty on suburban and residential traffic, while it is also suitable for goods service as driving wheels of moderate diameter are fitted. The general lines of the design will have become familiar in the clockwork No. 2 Special Tank while the motor fitted is of the pattern used in the Hornby No. 3E locomotives. This is designed to run on 6 volts D.C. from an accumulator or it may also be run on current from A.C. mains through a suitable transformer. Reversing in these motors is effected by a lever on the engine and speed regulation is afforded by means of a resistance controller. It is expected that this locomotive will be extremely popular and will be seriously considered by the Locomotive Committees of many Branches that have electrically operated layouts or where the installation of electricity is anticipated.



Hornby No. 2 Electric Tank Locomotive.

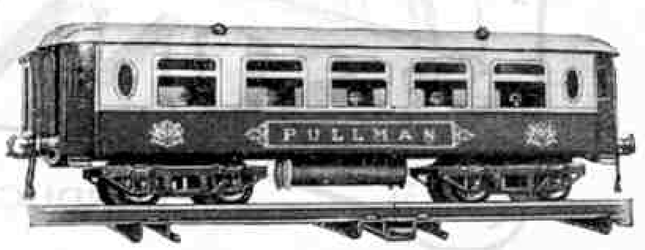
The saloon type of coach that is now so widely used on our railways to-day is the subject of another introduction into the Hornby Series. These are handsome vehicles and are attractively finished to represent the stock of the L.M.S. and L.N.E.R. Companies. A train composed of them will form a useful addition to the rolling stock of any Hornby Railway. They are carried on two four-wheeled bogies and are of the central corridor vestibuled variety. A gangway connection is provided with each coach so that a complete train of them has a remarkably fine and realistic appearance.



Hornby No. 2 Saloon Coach.

They are also available in the Brown and Cream livery of the Pullman Car Company.

Another innovation in rolling stock is the "Castrol" Oil Wagon. Its purpose is obvious and its bright colour makes it a notable wagon in any miniature goods yard. It is enamelled in green with striking red lettering while its design in general is the same as previous oil tank wagons of the Hornby Series. A change that cannot fail to meet with the approval of all miniature railway owners is to be made to many wagons in the range. This will be found in the provision of a new design of base. In this the buffer height is lowered to match that made standard in the "Special" series of locomotives, axleguards of realistic design are provided having embossed springs and a tie-bar connects the lower end of the axleguards. This latter feature is often seen on present day wagons. Between the solebar and the tie-bar a dummy brake V-hanger is found, while provision is also made for the addition of axleboxes should these be desired by the owner. These are available separately at a cost of 6d. per dozen and may be obtained through any Hornby Train Dealer. At the moment, however, no photographs are available of a wagon fitted with the new base.



Hornby No. 2 Pullman Coach.

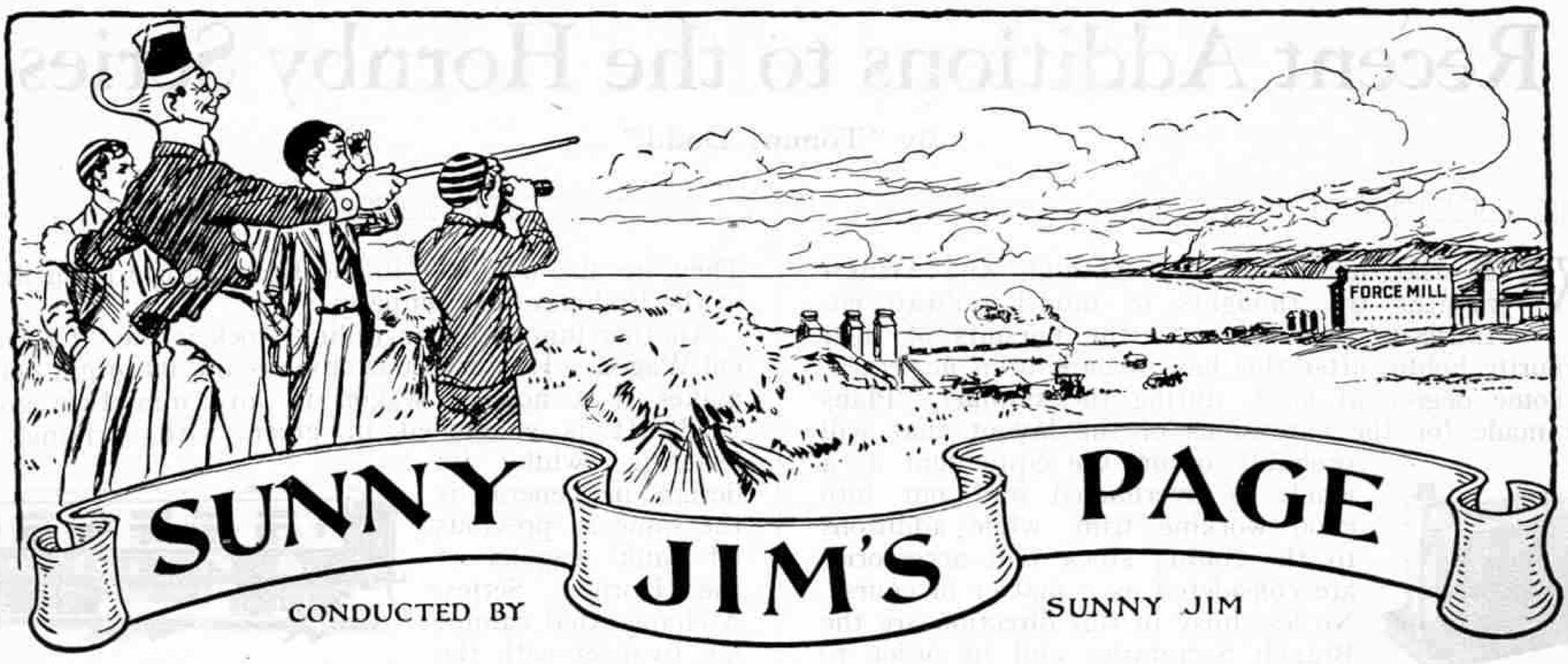
A lineside accessory which will be found very welcome is the Platelayer's Hut. This is a realistic representation of a brick built hut and is provided with an opening door. The roof is shaped to represent the particular roof so often found on the originals and raised battens are embossed upon it. Accommodation is thus afforded for the permanent-way staff and the tools and appliances they use in the maintenance of the line. The provision of a chimney implies a cheerful fire in winter time so that the miniature railwaymen will be assured of warmth during inclement weather. These little huts may be placed in many positions on a miniature railway and will impart to it a surprising touch of realism.

They are of picturesque appearance and the door is provided with a spring.



Hornby "Castrol" Oil Tank Wagon.

A useful "gadget" that has been introduced will be welcomed by all those who operate Hornby Electric locomotives. This is a combined rail gauge, screwdriver and spanner. The rail gauge portion is slotted in the centre to enable the gauge to clear the third rail. At one end of the tool is a spanner, made to suit the crankpin nuts of Hornby Electric locomotives, at the other is formed a special slotted screwdriver to operate on the axle nuts.



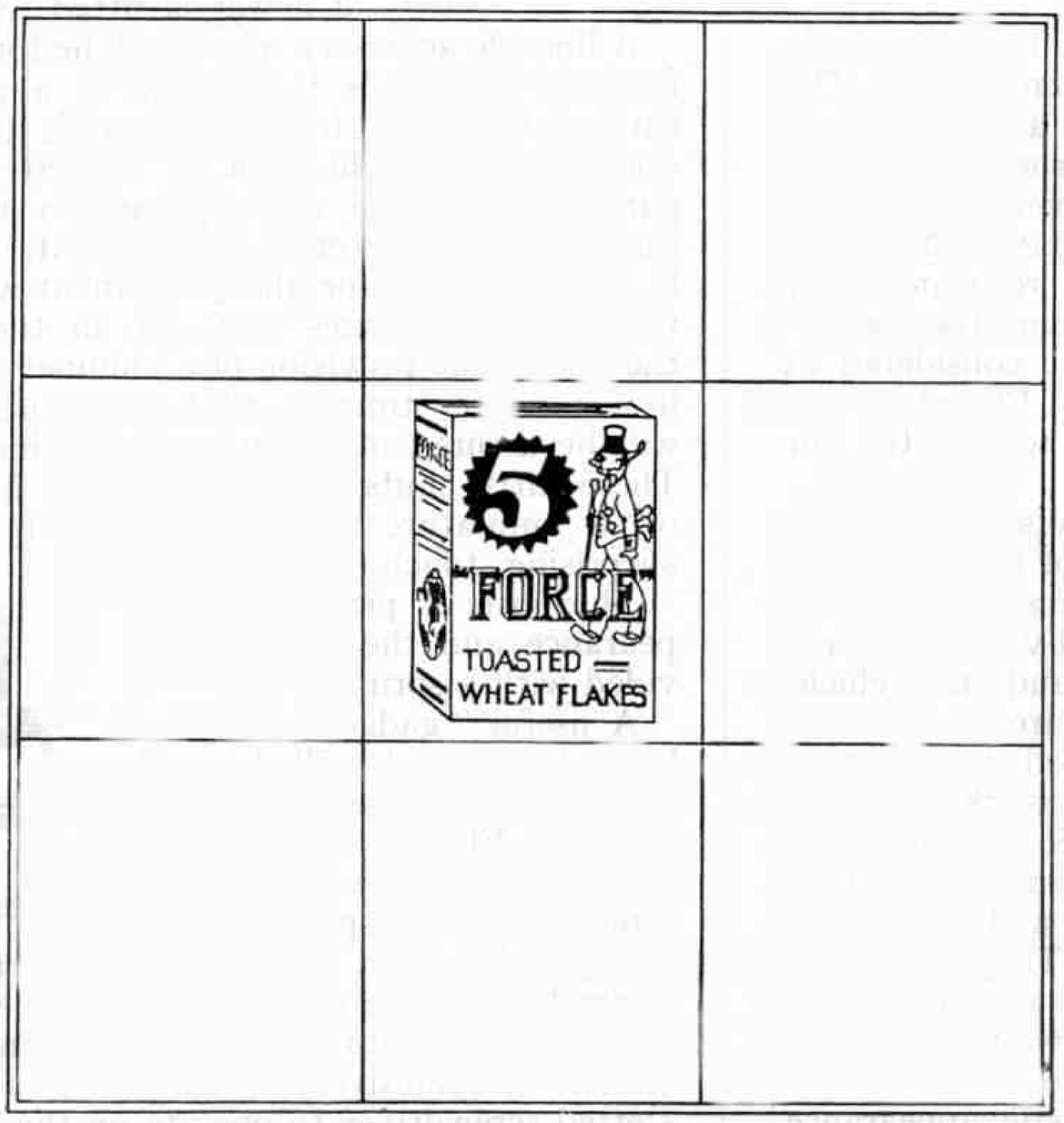
Sunny Jim says

"CAN YOU ARRANGE THESE TO MAKE 15 EACH WAY"

Now, all you mathematically-minded Meccanoites, here's a brain-test that is not quite so simple as it looks. Try it on Mother or Father, or even Sister. All you have to do is to cut out the "FORCE" packets 1, 2, 3, 4, 6, 7, 8, and 9, and arrange them in the small squares so that the lines total to 15 no matter which way you read them—across, up and down, or diagonally. If you don't like to cut up this page, copy the diagram on another sheet of paper and just write the numbers on it. Lots of you will find it easiest to solve the puzzle by trial and error—that is by keeping on altering the numbers about until they *do* come right. But I shall be surprised if those who have "FORCE" for breakfast do not think of a way of reasoning it out more simply.











Of course, it needs much more brains to work it out that way, but fellows who have "FORCE" regularly are usually more brainy as well as stronger than those who have never tried this topping food.

I have "FORCE" for breakfast and supper as well, with cold milk in Summer and hot in Winter, and sometimes I have it with fruit, and that's jolly nice, too. So I know that it makes you healthy and strong and full of energy, and your brain is always alert, not tired and sluggish like some people's.

If *you* don't have "FORCE" already, mention it to Mother. Tell her it's ready-cooked; she'll like that as it will be less trouble for her. "FORCE" is the whole of the wheat, cooked with barley malt, then made into flakes and toasted until it is crunchy crisp. No wonder it tastes so good, and *is* so good for you!

If you have not already had "FORCE" for breakfast, when you've solved this puzzle, send it with your address to

Sunny Jim, 197, Great Portland St., LONDON, W.1, and I will send you free a sample packet of "FORCE," so that you can start eating this best of all boys' foods at once.

Yours forcefully,

Sunny Jim

H.R.C. COMPETITION PAGE

Jumbled Signals Competition

Competitions appearing on this page are open only to members of the Hornby Railway Company. Envelopes containing entries should have the title of the competition clearly written in the top left-hand corner and should be addressed to the Hornby Railway Company, Binns Road, Old Swan, Liverpool. The name, address and membership number of each competitor should appear in clear writing on every sheet of paper used.

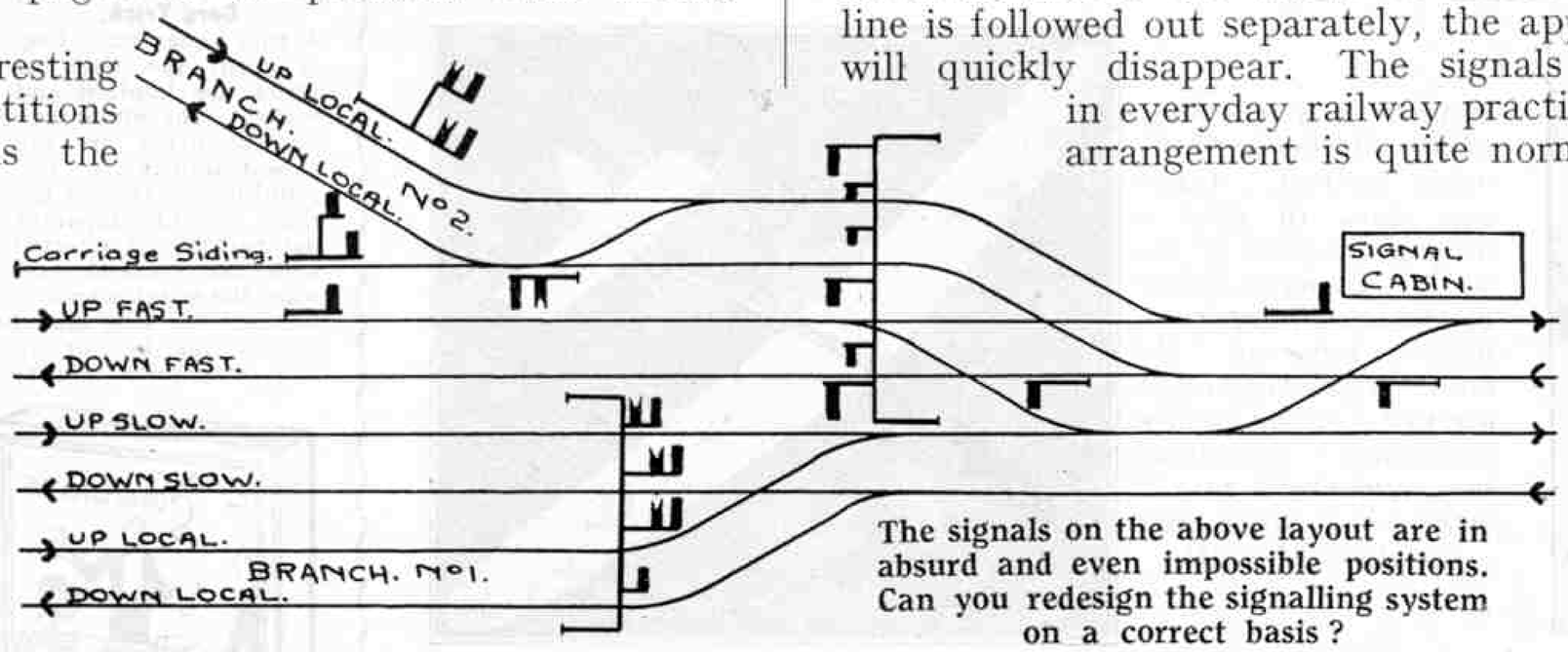
The competitions that are announced on this page, month by month, form one of the most popular features of the H.R.C. section of the "*M.M.*" This is proved not only by the large numbers of entries for each contest, but also by the many letters we receive from enthusiastic members of the H.R.C., many of whom would like two pages of competitions each month instead of one!

The most interesting feature of competitions of this kind is the opportunity they afford of testing our knowledge of real and model railways and their working. By entering for a series of contests of different types we are able to see whether our ideas are correct and to find out any weak or doubtful points in our knowledge. This is particularly the case with "lone" members who live in places where they are unable to join a branch of the H.R.C., and thus have no opportunity of discussing railway topics with other enthusiasts in an interesting manner.

Records have been kept of the number of entries for each H.R.C. competition since their commencement, and these show that the most popular contests are those in which it is required to identify certain railway features, or to find and correct mistakes purposely made in a diagram. This month we provide our readers with an opportunity of testing in a practical manner their knowledge of railway signalling. We have published many articles on this subject from time to time, and it is dealt with in the "How to Get More Fun" section for last month and this month.

In the accompanying diagram the various signals are placed in impossible or absurd positions, where they could not serve any practical purpose. What competitors have to do is to copy out the diagram as neatly as possible and then insert the signals in their correct positions.

Some readers possibly may think, after taking a hasty glance at the diagram, that the problem is too complicated for them. It is not really complicated, however, and if the course of each main and branch line is followed out separately, the apparent difficulties will quickly disappear. The signals are those used in everyday railway practice, and the track arrangement is quite normal. The whole problem is in fact quite straightforward, and there is no "catch" in it.



The signals on the above layout are in absurd and even impossible positions. Can you redesign the signalling system on a correct basis?

The completed drawings should be marked on the back with the competitors name and address, and his H.R.C. number. They should then be enclosed in envelopes marked "Jumbled Signals" and posted to H.R.C. Headquarters, at Binns Road, Old Swan, Liverpool.

The competition will be divided as usual into two sections, "Home" and "Overseas." In each of these the sender of the diagram that is most nearly correct will be awarded a prize of Hornby Train goods (or Meccano products, if preferred) to the value of 21/–. For the three entries in each section that are next in order of merit, similar prizes of value 15/–, 10/6 and 5/– respectively will be given. A number of consolation prizes also will be awarded, and in the event of a tie for any prize neatness and originality in presentation will be taken into account. Any entry that does not bear a H.R.C. membership number will be disqualified.

Entries in the "Home" Section should be posted to reach Headquarters on or before the 31st October, and the closing date for Overseas competitors is 31st January, 1931.

Favourite Railways

Railways probably exert a greater fascination in this country than anywhere else in the world and interest in British locomotives, from the mighty main line passenger express engines of each of the four great railway groups down to the most humble shunting tank, is shown by a surprising number of people. Keen debates on the merits of the representative engines of the different groups often take place. From discussions on locomotives it is but a step to the comparison of the companies themselves, and each of the four groups finds eager partisans among railway enthusiasts. This is particularly the case with members of Branches of the H.R.C., and accounts frequently reach Headquarters of lively debates on their relative merits. In view of the great interest of this topic we have chosen as the subject of our second competition this month "My Favourite Railway," and we ask members to tell us in not more than 500 words which railway company they favour and why it makes a special appeal to them. Prizes of Hornby Railway material (or Meccano products if preferred) to the value of 15/–, 10/–, 5/– and 2/6 will be awarded for the four best entries. Envelopes should be clearly marked H.R.C. "Favourite Railways" Contest and must be despatched to reach Headquarters on or before the 31st October 1930. Closing date for the Overseas section, 31st January, 1931.

H.R.C. Competition Results

July "Missing Links" Contest.—First: R. Batten (9089), London, E.16. Second: R. Wood (179), Manchester. Third: H. E. Jones (14740), London, E.4. Fourth: A. S. Taylor (17088), London, N.21. Consolation Prizes: J. C. Catford (15571), Portobello. A. R. Appleton (13293), Cambridge. G. L. Nicholson (9622), Ryde, I.O.W. D. D. Porter (10440), Birkenhead. E. C. Burrage (7037), London, N.4. A. G. Cheston (1321), Horley, Surrey. G. R. Palmer (6610), Leicester. I. M. Sutherland (7280), Luton.

Look out for Gamages Bumper Xmas Bazaar Next Month

GAMAGES

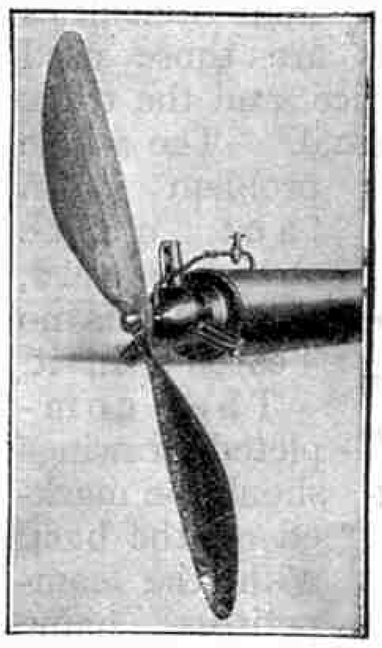
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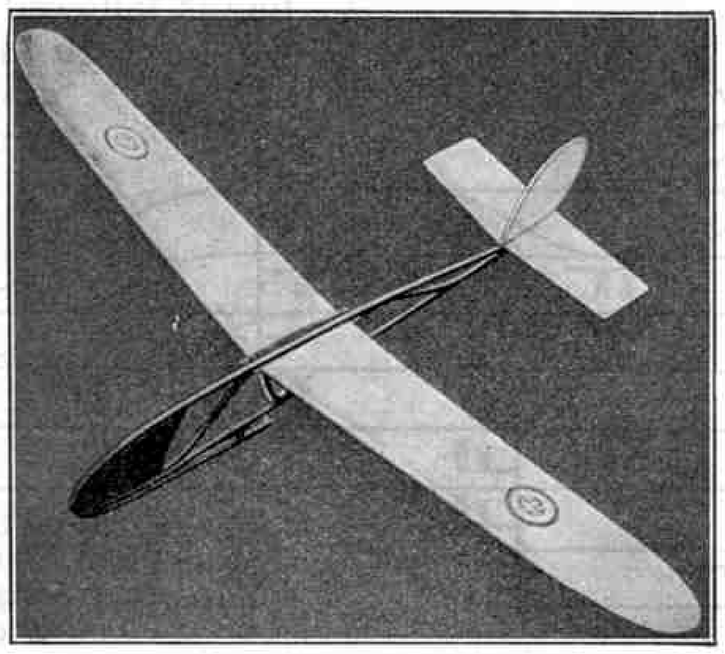


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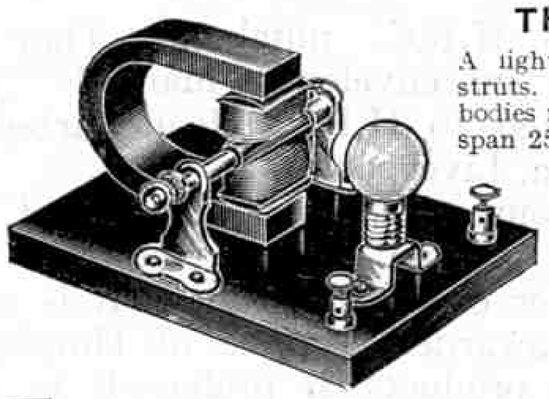


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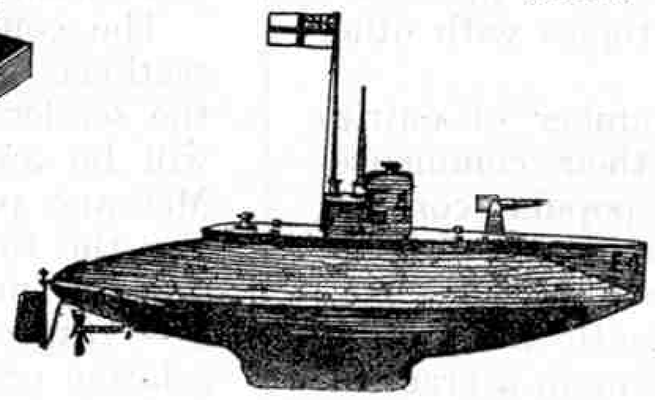
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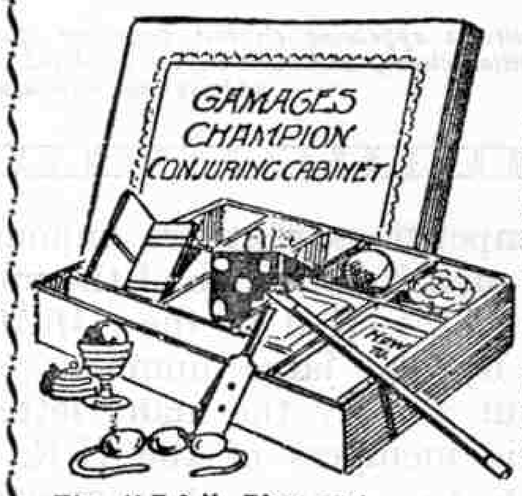
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Super quality chromium plated. **16/6.** Post 9d.

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is the greatest book of its kind in the world. Packed with thousands of Toys, Models, Games, etc., 130 pages. Freely illustrated. Send for your copy now.

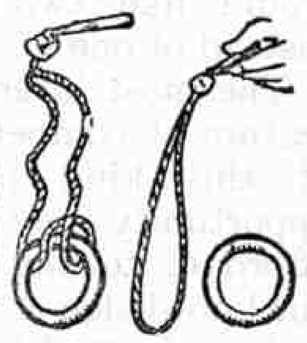


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An ideal Gift for a boy. Amuses for hours. Complete with full instructions Prices: **3/–** **4/6** Post 3d **7/9** **10/9** **15/9** Post6d **22/6** **35/–** **42/–** **63/–** **84/–** **105/–**

The "E.S." Ring and Cord Trick.
A ring hangs on a loop of cord, the ends of which are knotted and sealed. The whole may be submitted to the closest scrutiny. The problem is to remove the ring. This apparent impossibility is effected with the greatest ease when the secret is known. Further, the ring may be replaced on the cord by any ring, key, or other object offered. This is a remarkable novelty. Price **2/6.** Post 2d.





Easy Conjuring without Apparatus.
The book of the year. You cannot afford to be without it. Shows you how to perform hundreds of tricks easily with cards, handkerchiefs, coins, paper, matches, etc., etc. No apparatus required. Be the envy of all your friends at this year's party and blossom forth as an amateur conjurer.
Price **2/–.** Post 3d.

Rice Bowls and Water Vase.
Two bowls are shown; fill one with rice, then cover with other; the quantity of rice is mysteriously doubled. Level off the rice, cover again; this time rice changes to water, which is poured into vase. Then turn vase upside down, showing water has vanished No skill required.
Small, **3/6.** Medium, **5/–.** Post 6d.





The Magic Box and Ball.
The ball is taken out of the box, concealed in the pocket and the box closed; the ball is commanded to reappear in the box, where it is seen when opened. Again the box is closed and the ball caused to appear in back pocket, and the box shown empty again.
Price, complete with full instructions. Large size. Price **2/6.** Post 3d. Smaller sizes. Prices **1/–** and **1/6.** Post 2d.

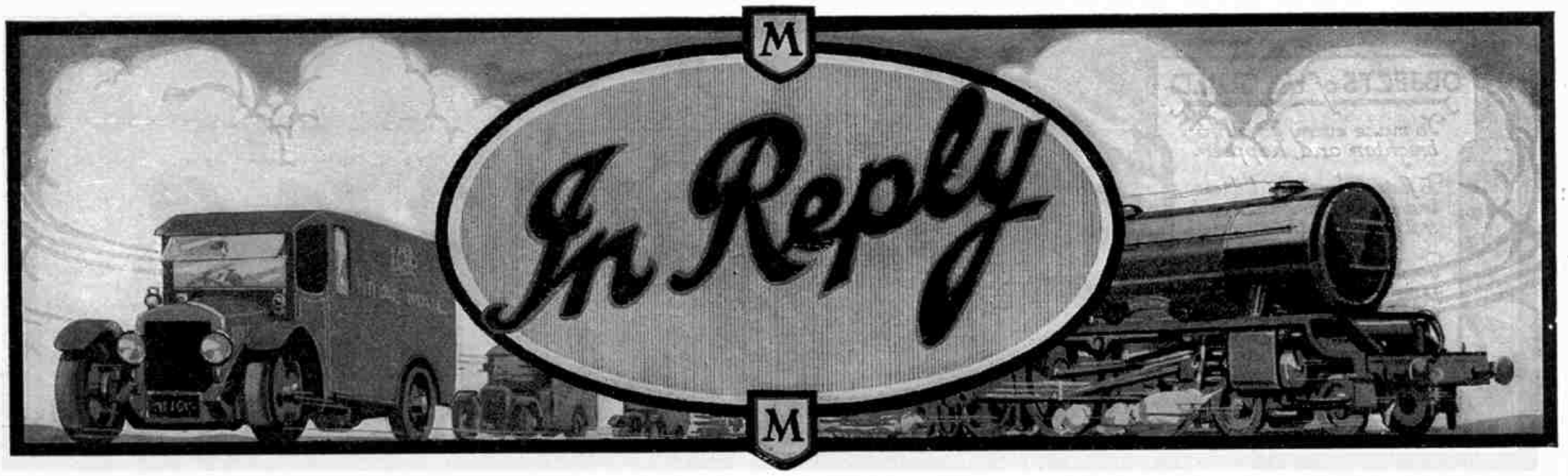
Bluff Watch.
The audience are handed a watch with a nickel cover, they set the hand at any hour, and cover over, but the conjurer can always tell at what hour watch has been set. Can be repeated again and again. Wonderful effect.
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Suggested Hornby Train Improvements

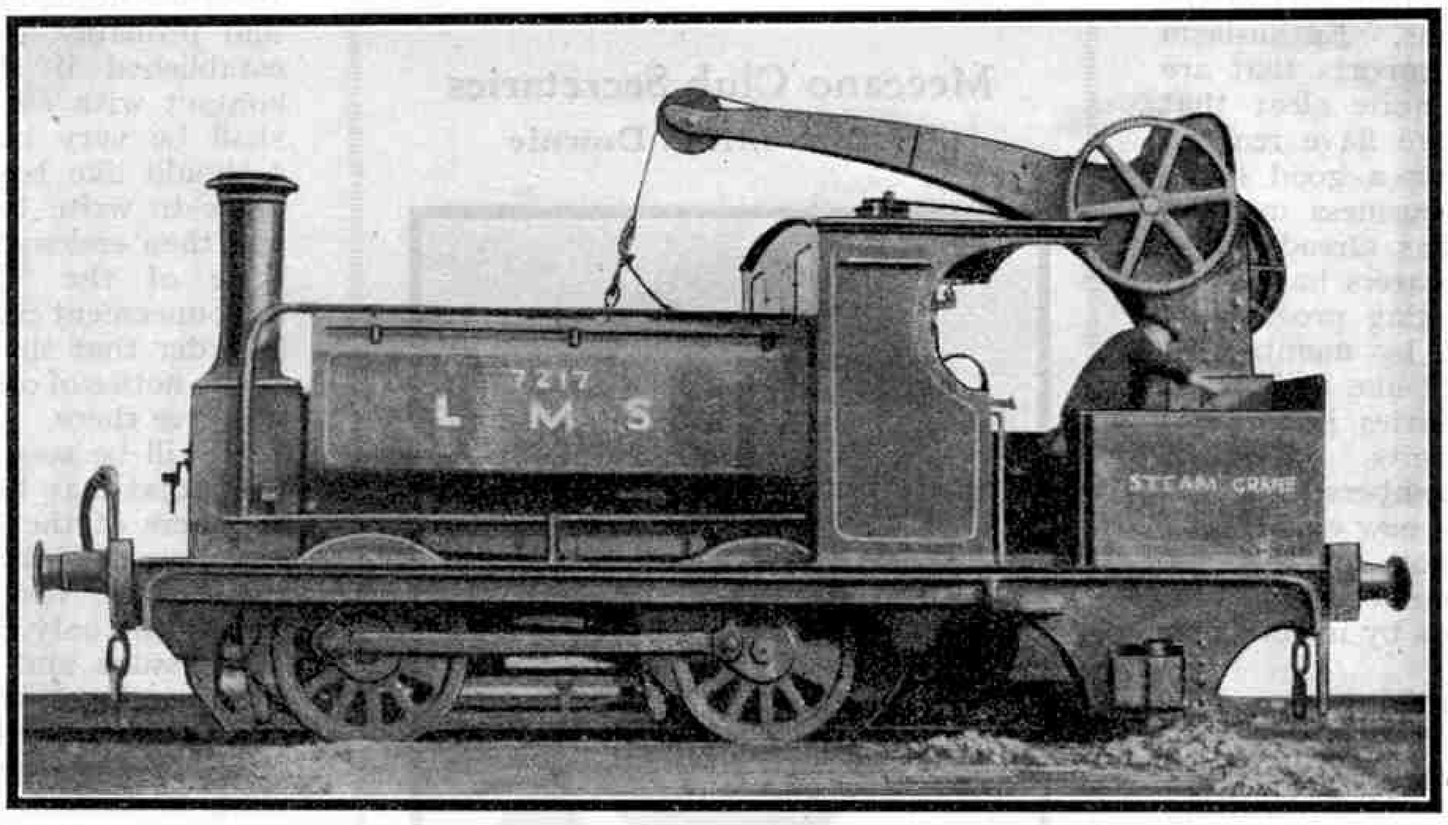
12-WHEELED PULLMAN CARS.—We are aware that a number of Pullman cars in service are carried on six-wheeled bogies, but modern practice favours the use of the four-wheeled bogie of long wheelbase and this is the pattern represented on Hornby Pullman Cars. The adoption of your proposal would lead to increases in weight and cost with no compensating advantages. (*Reply to R. Meyer, Deal*).

ELECTRICALLY-LIT SIGNAL LAMPS.—We are interested in your proposal that the lamps of Hornby Signals should be fitted to take small electric bulbs. This would be quite practicable and certainly would add to the attractiveness of the signals. The alteration would be costly, but we shall consider this point when revising the Signals of the Hornby Series. (*Reply to R. F. M. Swinford, Margate*).

TAIL LAMPS FOR BRAKE VANS.—The provision of lamp irons on brake vans for use in conjunction with the detachable lamps now available would be a realistic addition to the Hornby Series. When revision of our Brake Vans and Composite Coaches next occurs we shall give careful consideration to the suggestion that these should be fitted. (*Reply to T. Roberts, Middlesbrough*).

ELECTRIC CROSSOVER.—The inclusion of an electric crossover in the Hornby Series would enable the fullest value to be obtained from the Hornby Electrical Double Track, and more interesting layouts could be planned. Your proposal is receiving careful consideration. (*Reply to D. Jones Ruthin*).

ELECTRIC CAPSTAN FOR WAGON SHUNTING.—We are interested in your proposed design for an electrically-operated capstan for the haulage of goods wagons in and out of a large goods depot. We do not think there are many layouts on which use could be made of such an accessory, and this, together with its necessarily high price, prevents us from including it in the Hornby Series. We suggest that you construct a capstan suitable for your requirements from standard Meccano parts. (*Reply to R. Blades, Birmingham*).



A veteran crane locomotive of the L.M.S. The safety valves of this 0-4-2 saddle tank engine project from the cab. In working order the locomotive weighs slightly over 32 tons, and possesses a tractive effort of 6,512 lbs. This interesting photograph was taken by our reader A. Crawshaw, Shepherds Bush.

S.R. 4-8-0 TANK LOCOMOTIVE.—We scarcely think that gravity shunting is practised by miniature railway enthusiasts to such an extent as to justify the introduction in the Hornby System of a special locomotive for propelling wagons up the inclines of yards in which the method is employed. The S.R. tank locomotive you suggest as a model also has the disadvantage that it has eight coupled wheels. These would make the negotiation of 2 ft. radius curves difficult. (*Reply to F. Allen, Southampton*).

WHITEMOOR CONTROL TOWER.—At present the control tower at the Whitemoor yards of the L.N.E.R. is the only one of its kind in this country. It is a special structure and a representation of it would be out of place on a system representing any other group but the L.N.E.R. For this reason it is not likely that such an accessory would be sufficiently popular to justify the expense of its introduction. (*Reply to G. T. Dane, Oundle*).

TELEGRAPH INSULATORS ON SIGNAL CABIN.—Your suggestion to fit insulators on the Hornby Signal Cabin is interesting. These would enable "telegraph wires" to be led to it in a very realistic manner. Such an addition cannot be undertaken at present, but we shall consider it when the design of our Signal Cabin is revised. (*Reply to L. Douglas, Crouch Hill*).

G.W.R. DOCK SHUNTING LOCOMOTIVE.—We do not think there would be a great demand for a reproduction of any particular pattern of dock shunting locomotive, and are not likely to introduce a model of the G.W.R. engine you suggest, or of any other locomotive employed for this special purpose. We think you will find it satisfactory to employ a standard Hornby No. 1 Tank Locomotive painted in Great Western colours. (*Reply to V. Russell, Bristol*).

L.M.S. (L. & Y. SECTION) "ATLANTIC" LOCOMOTIVE.—We agree that a model of this locomotive would make an attractive addition to the Hornby System, but there are several difficulties that prevent our carrying out your suggestion. Apart from other considerations these locomotives are now being withdrawn from service. In addition no corresponding types are in use on the other groups, and thus the cost of production would be relatively high. (*Reply to S. Bainbridge, Huddersfield*).

MINIATURE STEAM SHOVEL.—We doubt whether sufficient employment could be found for a model steam shovel or "navvy" on a miniature railway system. These are rarely seen, except when new works and extensions are in progress, and especially on an indoor layout their application would be limited. For this reason we are unable to consider your proposal, but suggest that you use Meccano parts to construct a model of a steam shovel to suit your own requirements. (*Reply to O. Hanson, Colchester*).

FIREMAN'S SHOVEL AND TOOLS.—We agree that the tenders of Hornby Locomotives would look more realistic if a firing shovel and suitable tools were provided. We think that those provided with the Watchman's Hut are quite suitable for the purpose, and we suggest, therefore, that you make use of these. They are available separately, price 1d. each, and may be obtained through any Hornby Train dealer. (*Reply to K. Green, Bristol*).

PLATELAYER'S HUT.—A platelayer's hut now forms one of the interesting lineside accessories available in the Hornby Series. This is an attractive miniature representation of the huts frequently seen along the tracks of our railways. It is sold at the price of 2/6. *Reply to A. Callan, Sheffield*).

QUARTER-RAIL LENGTH BRAKE AND REVERSE RAIL.—On a complicated station or goods yard layout, brake and reverse rails cannot be fitted in every position in which they would be useful, chiefly because of the large proportion of curved track employed. To a certain extent, the inclusion in the Hornby Series of a short brake and reverse rail would overcome the difficulty and we shall give your proposal our careful consideration. (*Reply to D. Smith, Hawick*).

NAME BOARDS FOR MINIATURE EXPRESSES.—We think that name boards, to enable the miniature expresses run on Hornby layouts to be correctly designated, would be an interesting and popular addition to the Series. When a suitable opportunity occurs the possibility of introducing them will be carefully examined. (*Reply to F. Moore, Berwick*).

SAND PIPES ON LOCOMOTIVES.—The realistic effect of a model locomotive is certainly increased by the provision of small details such as sand pipes. These are placed in exposed positions and usually are fragile and therefore readily damaged in the event of a derailment. For this reason we have not thought it advisable to mount them on our locomotives. A further reason is that the extra cost made necessary by the inclusion of fittings of this character frequently is out of all proportion to the advantage gained, so that their addition to our locomotives is not likely to occur. (*Reply to T. Webb, Newbury*).

WEIGHT-CONTROLLED BRAKES ON WAGONS.—We are interested in your suggested design of brake gear in which the blocks are applied to the wheels by the action of a weight incorporated at the end of the brake lever. To be effective a heavy weight would be required and this probably would appear disproportionately large. The scheme is being filed for further attention, however, for the inclusion of a few brake-fitted wagons in the rolling stock of a miniature railway would be a useful feature, especially where gradients are incorporated in the layout. (*Reply to C. Brown, Victoria, Australia*).

0-6-0 SADDLE TANK LOCOMOTIVE.—We are aware of the extensive use to which locomotives of this type are put by railway companies and in the yards of private firms. A model of this type probably would be a popular addition to the Hornby System, but until a six-coupled mechanism is available we are unable to make any move in this direction. A suitable design would need careful preparation in order to represent in some degree the practice of the four groups, for it would scarcely be possible to construct a separate locomotive for each railway. (*Reply to H. Keetley, Lincoln*).

OBJECTS of the GUILD

To make every boy's life brighter and happier.

To foster clean-mindedness, truthfulness, ambition and initiative in boys.

To encourage boys in the pursuit of their studies and hobbies, and especially in the development of their knowledge of mechanical and engineering principles.

The Meccano Guild

With the Secretary

Value of a Good Start

In the majority of Meccano Clubs the month of October sees the beginning of activities of the first winter session. In practically all cases a very enjoyable time has been spent in the outdoor pursuits of the past few months, and members are returning with enthusiasm to the indoor hobbies and sports that form the chief part of the work of the coming sessions. Enthusiasm runs high and from the reports that are now reaching me, it is quite clear that officials and members alike have realised the importance of making a good start. In many instances the business meeting that opens the session has already been held, enthusiastic office-bearers have been appointed and an interesting programme drawn up and approved by members.

One thing that I should like to impress upon Leaders and secretaries is the importance of securing recruits. Even in clubs that have lost no members since last winter the introduction of new enthusiasts is sure to be advantageous, for this not only strengthens the resources of a club, but also makes for progress by introducing new ideas.

For this reason a recruiting campaign should coincide with the beginning of the winter session. This need not be expensive or elaborate and, in fact, the best recruiting agency for a club is the obvious keenness of those who are already members. Most of them probably have acquaintances who are interested in Meccano and may readily be persuaded to throw in their lot with the club in order to obtain the utmost benefit from their hobby. Efforts on the part of members may be followed by personal visits from the Leader or secretary and, as I pointed out last month, it is an excellent plan to explain to the parents of prospective members exactly what the club stands for and how the time allotted to its meetings is spent.

In this connection I should like also to say a word to Guild members who have not yet become members of clubs. There is no doubt that they are missing one of the most valuable features of the hobby if they fail to get into touch with other Meccano enthusiasts, with whom they may exchange ideas and enlarge their experience. Those who have not yet joined a Meccano club should immediately seek out the nearest or most convenient Meccano Club and have themselves enrolled as members. I shall be very pleased to hear from any boys who wish to follow this course and to give them the names and addresses of the secretaries of suitable clubs in the district in which they live in order that they may take the necessary steps to become members. I shall also be glad to assist the officials of clubs in a similar manner by forwarding them the names and addresses of Guild members who reside near the club room and are thus likely to be interested in the work carried on.

Meccano Club Secretaries

No. 20. Mr. F. Downie



F. Downie is the hard-working Secretary of the Hobart (Tasmania) Meccano Club, which was affiliated to the Guild in 1928. The club has a large membership of enthusiastic model-builders, and special features are made of competitions of all kinds, and of debates and impromptu speeches.

Founding New Clubs

In certain instances it may be impossible for a Guild member to join a club because no suitable organisation is in existence. If the district in which he lives is sufficiently populous he should consider the possibility of forming a club. It is almost certain that in the same neighbourhood there will be other Meccano boys in a similar position and probably a successful club could be established if these were brought into contact with each other. Here again I shall be very pleased to give assistance. I should like boys who propose to found clubs to write to me immediately, and I will then endeavour to include in an early issue of the *"Meccano Magazine"* an announcement regarding the proposed club in order that the scheme may be brought to the notice of other readers of the *"M.M."* who live there.

It will be seen that there is interesting work that may be done by all enthusiastic members of the Guild, whether these are members of clubs or not. The wonderful growth of the organisation since its foundation only eleven years ago is a proof of its value and of the manner in which its advantages are appreciated. I hope that every member will do his best to spread knowledge of the Guild and of the work of Meccano clubs in order that the winter sessions of 1930 and 1931 may be one of record growth.

* * * *

The Holy Trinity (Barnsbury) M.C. will hold their twelfth Annual Exhibition in the Parish Hall, Richmond Rd., Barnsbury, on the 24th and 25th of this month. The Exhibitions arranged by this old established club are always noteworthy and preparations have been made for maintaining in the forthcoming event the reputation that the club has established. On the first day the Exhibition will be opened at 5.30 p.m., and on Saturday proceedings will commence at 2.0 p.m. A special invitation is given to officials and members of other Meccano clubs, and indeed all who are interested in the hobby will be heartily welcomed.

Proposed Clubs

Attempts are being made to form clubs in the following places, and boys interested in becoming members should communicate with the promoters, whose names and addresses are given below :—

AINSDALE—Mr. W. E. Williamson, 10, Delamere Road.
ASHTON-UNDER-LYNE—Mr. H. Etherington, 92, Turner Lane.
LONDON—A. T. Field, 76, Lavendar Grove, Dalston, N.E.8.
LONDON—S. V. Leach, 77, Union Street, Southwark, S.E.1.
NEW ZEALAND—H. J. Grant, Outram, Otago.
PERTH—William J. Urquhart, Poultry Farm, Burghmuir.
RAMSGATE—Rev. F. T. Rider, 5, Crescent Road.
WEST HARTLEPOOL—A. H. Weatherhead, 57, Furness Street.



CLUB NOTES



Attenborough Choir M.C.—The Exhibition was very successful. Members constructed many excellent models, and each was criticised and improvements recommended by the Leader before being placed on view. Members spent an interesting time in building two Bridges across a stream near the club room. Other outdoor activities have included Cricket Matches, Paperchases and Races. An interesting innovation was an outdoor Drawing Competition, members' sketches being completed at the next indoor meeting. Club roll: 18. *Secretary:* G. W. Render, Attenboro' Lane, Chilwell, Notts.

Lindisfarne College M.C.—The summer programme consisted entirely of open air meetings and many interesting excursions were made. These included visits to a Dairy Farm, a Mineral Water Works and Tilbury Docks, where the new rolling lift bridge was a great attraction. In small parties members also visited a Picture House, where they were admitted to the operating room to inspect the Western Electric sound film projector during operation. The local Automatic Telephone Exchange also was visited and an exceptionally interesting time was spent at the Polar Expeditions Exhibition. Indoor meetings have now been resumed and members are busy on models for the Exhibition and Visitors' Night. Club roll: 42. *Secretary:* H. Sebel, 27, Seaforth Road, Westcliff-on-Sea, Essex.

Newcomen (Hull) M.C.—At the Annual Meeting the officials' reports on a very successful first year's work were submitted, and the prizes awarded for the highest number of points scored were presented to the successful competitors. The outdoor games season has been very enjoyable, activities having included Cricket Matches, Paper Chases and Cycle Runs. Club roll: 10. *Secretary:* H. Acklam, 103, Newcomen St., Hull.

Heywood Central School M.C.—Good use has been made of the summer session, and interesting visits included one to the Printing Works of Allied Newspapers Limited at Manchester. An Exhibition of models was held in connection with "Parents' Day" at the School, and it was noticed that the greatest interest was displayed by parents of non-members and of boys not in possession of Meccano Outfits. Club roll: 43. *Secretary:* C. Johnson, 6, Holland St., Heywood, Lancs.

Churchill M.C.—The club now possesses an extensive Meccano Outfit, and also has been supplied with benches and tools of various kinds, through the kindness of Mr. Halliday, County Organiser for Handicraft. Mr. Halliday also gave a splendid lecture on "*How we got our Trades.*" Members have constructed a scale model of the boat used by the Oxford crew in the last boat race. Club roll: 17. *Secretary:* Mrs. C. E. Blake, The School House, Churchill, Oxford.

Downend M.C.—Among interesting visits was one to the factory of the Bristol Aeroplane Co. Ltd., at Filton, where aeroplanes in all stages were seen. A lecture has been given by Mr. H. W. Humpage on the "*Motor Cycle,*" this being accompanied by a demonstration, including the dismantling of a motor cycle engine. Club Roll: 23. *Secretary:* George Bailey, Downend Farm, Downend, Nr. Bristol.

Ipswich M.C.—Several members visited the last Annual Exhibition of Harwich M.C. at which models built by members of the Ipswich Club were exhibited. During the summer Cycle Runs have been held and Cricket Matches played, and a number of members spent an enjoyable week in camp at Felixstowe. Air Rifle Shooting has been introduced and an interesting and varied programme arranged for the coming months. Club roll: 12. *Secretary:* P. Samson, 81, Tuddenham Road, Ipswich.

Laindon M.C.—Membership shows an increase. The programme includes Model-building Competitions and Hornby Train Evenings, when talks are given by the Leader on railway subjects. Club Roll 16. *Secretary:* J. P. Tourle, "St. Ives," Leicester Road, Laindon, Essex.

Fulstow Junior M.C.—Novel features in the varied summer programme included Fishing Matches, Boat Races, Treasure Hunts and Tennis Tournaments. Outdoor Model-building Competitions and a Wild Flower Show also have been held. Models built by members, and others on loan from Headquarters were displayed at a Garden Fête, at which a large Hornby Train Layout also was on view. Club roll: 16. *Secretary:* L. W. Doe, The Stores, Fulstow, Nth. Thoresby, S.O. Lincs.

Newcastle-on-Tyne M.C.—Outdoor meetings have been held regularly, and in conjunction with the Newcastle Branch of the H.R.C. a very enjoyable visit was paid to Liverpool in order to make a tour of the Meccano factory. A successful exhibition of models was given at the Trades and Industrial Exhibition of the Consett Y.M.C.A. Preparations are already being made for the Annual Exhibition, and among other activities a Jazz Band is being formed. Club roll: 37. *Secretary:* John Fraser, 154, Fenham Hall Drive, Fenham, Newcastle-on-Tyne.

Herne Bay M.C.—Has been very active during the summer months. Cricket Matches have been played and several Picnics have been held, while a number of members spent two week-ends under canvas at Bishopstone Glen, where they had a jolly time, scouts from a neighbouring camp uniting with members in camp fire sing-songs. The winter programme includes light Metalwork and Woodwork in addition to Meccano Model-building, Stamp Collecting and Fretwork. The aptly named "Blue Triangle" Football Club hopes to improve on last season's achievement, when on its first appearance it attained a good position in Division III of the Canterbury and District League. Members of this club consisted of the older adherents of the Meccano Club, who meet regularly for Boxing and Gymnastic work in addition to Running, Football and Rink Hockey Sections. Club roll: 43. *Secretary:* C. W. Russell, 4, Clifton Villas, Herne Bay.

Camborne M.C.—Cricket Matches and Rambles have formed the greater part of the summer programme. A very successful Garden Fête also was held. The Sideshows were particularly attractive and visitors keenly endeavoured to win prizes at the Sports Stall. Interest is added to Rambles by dividing members into two sections, one of which is required to track down and find the other, the members of which conceal themselves. Club roll: 12. *Secretary:* J. Rogers, 47, Hughville St., Camborne.

Ramsey M.C.—An Exhibition is to be held in November and models are being constructed for display on that occasion. Musical evenings have been greatly enjoyed, a jazz band having helped to make these a success. Club Roll: 12. *Secretary:* C. Butcher, Princess Street, Ramsey, Hunts.



Members of the Malvern Wesleyan (Johannesburg) M.C. with two large models of cranes built for exhibition at the Agricultural Show. This club was affiliated in 1921 under the Leadership of Mr. E. Sykes. Members are keenly interested in outdoor sports and a varied programme of indoor hobbies and indoor recreations is followed.

Australia

Thebarton Technical High School M.C.—Two interesting Model-building Competitions have been held. In one of these the competitors were asked to submit models of factory machinery, the prize winners submitting excellent models of Lathes. In the other, models of any means of transport were required, and a record entry included ingenious Motor Cycles, Motor Cars, Locomotives and Tramcars. A Lecture on "*Wheels*" was given by Mr. E. S. Gibson, the Leader, who illustrated his talk with diagrams and experiments. Talks by members have included one on "*Light and its Use,*" and a second on "*Early Aviation.*" These talks are to be regular features of club work, and a prize is being awarded to the member who gives the best short lecture. Club roll: 30. *Secretary:* A. Haegi, 4, Grace St., Hyde Park, South Australia.

Canada

Victoria (B.C.) M.C.—Has now secured affiliation and is making steady progress. Model-building Competitions have been held, the entries showing skill and originality on the part of members. At each meeting interesting short talks are given or an article on "*An Engineering Topic*" is read and a demonstration is given of a special Meccano model. Club roll: 7. *Secretary:* M. D. Bryce, 908, Heywood Avenue, Victoria, B.C.

New Zealand

Dunedin M.C.—A splendidly varied programme is being followed, the meetings including Model-building Contests, Hornby Train Nights and Games Competitions. The Anniversary Celebrations were very successful. An extensive display of models built by members has been on view in the window of the local Meccano dealer for three weeks. These attracted great admiration. Club roll: 8. *Secretary:* T. MacLachlan, Art Studio, 66, Albany St., Dunedin, Otago.

Dunedin Hobbies M.C.—Lectures have been given by the Leader on the "*Eiffel Tower*" and the "*Panama Canal.*" These are the first of a series on the "*Seven Modern Engineering Wonders.*" A display of models built by members was given at a local Carnival. These greatly interested visitors, and the Exhibition was useful in gaining recruits. An Aviation Section has been formed, and a special night is to be devoted to discussions on Aircraft and the building of models of aeroplanes. Club roll: 41. *Secretary:* R. W. Millis, 28, Clifford St., Dalmore, Dunedin.

South Africa

Malvern Wesleyan M.C.—Has celebrated its eighth birthday by a very successful Social. In the Model-building Competitions that are held regularly, the girl members are as keen as the boys, and many excellent contests have been held. Talks are given by both girl and boy members on various subjects. Sports figure prominently in the syllabus, Relay Races and Paperchases being specially popular. An interesting feature is that the Leader inspects each member's outfit from time to time, and prizes are presented to the members whose outfits are in the best condition at the end of the club year. *Leader:* Mr. E. Sykes, P.O. Box, 8, Cleveland, South Africa.

New Durban M.C.—Splendid models have been entered in recent monthly Competitions. These must be original and have included Tanks, Traction Engines, Aeroplanes, etc. An interesting variation is "Specified Model-building Night," when members are asked to bring certain Meccano parts, and on arrival are required to construct a certain model without the aid of descriptions. A Meccano Loom constructed by the Secretary has been exhibited in the window of the local dealer, where it attracted much attention. Club roll: 62. *Secretary:* R. A. Wallace, 29, Bell Grove, Durban.

1929
SIR CHARLES WAKEFIELD
International Cup
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WARNEFORD BUILT

The WARNEFORD JUNIOR AIR LEAGUE

To any **WARNEFORD** enthusiast obtaining a flight of 30 secs. duration with his Warneford Aeroplane a fine pair of Gold Wings and Certificate will be sent **FREE.** The flight must be witnessed and application signed by some responsible person.

1930
THE "GAMAGE" CUP
WINNING MACHINE
WARNEFORD BUILT

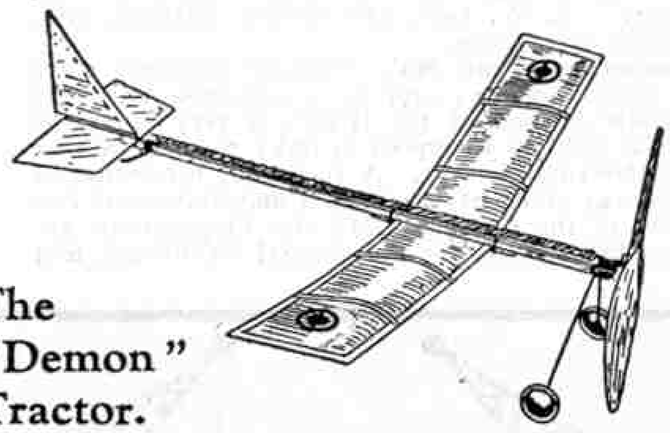
WARNEFORD

BRITISH *BUILT TO FLY WELL!* THE BEST

Other Tractor Models

THE "MOTH" - 4/6
THE "SWIFT" - 10/6
THE "RACER" - 21/-

Every part of Warneford Aeroplanes can be readily replaced, and a full list of all parts, with prices, is contained in the new 8 page leaflet, sent free on application.



The "Demon" Tractor.

Length 25½ in., span 23 in. Fitted 10 in. hand-carved and balanced propeller, patent double-bearing and shock-proof chassis, covered yellow proofed silk with identification discs. Weight and wind resistance are reduced to a minimum in this model, giving the utmost duration of flight. Weight 3 oz. Approximate flight 250 yards. (Pat. No. 296946). **Price 7/6**

The "MARVEL" Construction Set
Builds a fine 15" Tractor Model. Complete parts with Drawings. Price **1/6**

The "WILFLY" Pusher Mono.
15" Wing Span. Weight ¾ oz. A splendid flyer. Price **1/6**

THE WARNEFORD WINDER
Geared 5 to 1 ratio. Universal Fitting for all Warneford Models. Price **2/6**

Use "RUBERLUE"
Doubles the flight of Model Aeroplanes. Price **6d.** per tube.

Warneford Aeroplanes are obtainable from all good Stores, Toy Shops, and Sports Dealers throughout the Country.

Sole Manufacturer: **F. J. MEE, 137a, Greenwich Road, LONDON, S.E.10**



THE FIREWORKS THAT ALWAYS "GO OFF"

"Standard" FIREWORKS

THERE IS A SHOP IN EVERY TOWN SELLING "STANDARD"

Manufactured by STANDARD FIREWORKS LTD., Huddersfield

A. E. BEAGLE

Competition Page

"AD-BRANDS"

Among the many popular competitions that have appeared in the "*M.M.*" from time to time, the advertisement contests, featured some two or three years ago, must take a very high place. They aroused enormous interest and, incidentally, provided a very effective reply to the scoffer who declared that "boys don't read advertisements!"

Many readers have asked for other competitions of the same type "because they create so much fun for everyone in the family." In consequence we have been casting around for another topic, and, in the brand names of leading advertised products, believe we have found one that should prove just as popular as its predecessors.

RINSO	MY LADY	ERASMIC	SELO
FLUXITE	BLACK CAT	DIPLOMA	SORBO
ATORA	LUX	MANSION	TIME-O-DAY
COURTINE	KIWI	TRIPLEX	SECCOTINE
INGERSOLL	FLIT	SWAN	ACME
ZAM-BUK	MANIKIN	RALEIGH	DRUMMER
VAPEX	CASTROL	PEPSODENT	GRE-SOLVENT
PHITEESI	COLUMBIA	DRIPED	GOLDEN SHRED
ODOL	NELL GWYNN	HIGH TEST	WHITE HORSE
SOUPLEX	PHOSFERINE	TRIANGTOIS	BONNYBOY
FORCE	TUROG	KODAK	VIM
CLEMAK	ABDULLA	KIA-ORA	SUNKIST
YOUMA		LIFEBUOY	

We give here a list of 50 well-known advertised products, each of which is described only by the name under which it is advertised. Readers are asked first to identify the articles and then to make a list of the six articles in the list that they consider the most necessary to a boy's happiness, in order of importance.

Prizes of Meccano or Hornby Trains (to be chosen by the winners) to the value of £1/1/–, 15/–, 10/6 and 5/– will be awarded to the senders of the four longest lists of correct identifications, and, in addition, there will be a number of consolation prizes. In the event of a tie for any or all of the prizes, reference will be made to the placing of the six most important items and preference given to the competitor whose list most nearly agrees with the massed vote of all the competitors.

Entries must be written on one side of the paper only and each sheet of paper used must bear the name and address of the competitor. They must be addressed to "Ad Brands, Meccano Magazine, Binns Road, Old Swan, Liverpool," and sent to reach this office not later than 31st October. Overseas closing date, 31st January, 1931.

Competitors are advised to examine carefully the advertising pages of the "*M.M.*," for certain of the articles are advertised in them.

Visions of the Editor

Many years ago—in fact in one of the earliest of our drawing competitions—readers were invited to commit to paper their idea of the physical and facial appearance of the Editor of the Meccano Magazine. The outcome was a competition of amazing popularity and extraordinary fun.

They say "Laugh and grow fat." Well, it was many, many weeks before your Editor ceased to chuckle over certain of the entries and—but that's another story. Let us put it this way. Much ink has flowed from the Editor's pen since that famous competition closed, and he feels that in the meantime many readers will have revised their impressions. It would be interesting, if not diverting, to see just what readers believe the Editor looks like to-day.

Therefore, that famous drawing and painting competition, "THE EDITOR OF THE '*M.M.*' AS I IMAGINE HIM TO BE" is revived and we look forward to another bumper entry. Either paintings or drawings may be submitted and in the case of drawings, pen and ink, pencil or crayon, are equally eligible.

Entries will be divided into two sections, A for those aged 16 and over, B for those under 16, and prizes of Meccano or Hornby Trains (to be chosen by the winners) to the value of £1/1/– and 10/6 respectively, will be awarded to the senders of the best and second best entries in each section.

Competitors must give their name, age and address on the backs of their entries. It is not sufficient to write merely Section B or A, as the case may be, for an age allowance will be made when judging the entries, which must be addressed to "31st Drawing Contest, Meccano Magazine, Binns Road, Old Swan, Liverpool," and must reach this office not later than 31st October. Overseas closing date, 31st January, 1931.

Competition Closing Dates

HOME.

Ad. Brands	31st October.
31st Drawing Contest ...	31st October.

OVERSEAS.

Cut Outs No. 2...	31st October.
July Photographic Contest ...	31st October.
August Crossword Puzzle ...	29th November.
August Photographic Contest	29th November.
Doublets Contest	31st December.
September Photographic Contest	31st December.
Stamp Contest	31st December.
Ad. Brands	31st January.
31st Drawing Contest ...	31st January.

Watch the Closing Dates :

Competitors, both Home and Overseas, are particularly requested to make a careful note of the closing dates of any competitions for which they intend to enter.

In sending entries to competitions that are divided into age groups, competitors should take particular care to mark their ages clearly on the back of the entry. In judging the entries allowance is made for the age of the competitor.

Entries, other than prize-winning efforts, for photographic, drawing and similar competitions, will be returned to the competitors concerned if a stamped addressed wrapper is sent with the entry, and its return requested.

COMPETITION RESULTS

August Crossword Puzzle.—1. G. S. ROBSON (Chesterfield); 2. A. C. V. KENDALL (Favant, Nr. Salisbury); 3. R. D. HARRIS (Lincoln); 4. G. HOLLOWAY (Rochester). Consolation Prizes: R. J. COWAN (Upper Clapton, N.16); H. R. STOREY (Scarborough); W. G. COATES (North Shields); J. E. ROCCA (Edinburgh); E. ARCHER (Ilford); A. WEIR (Glasgow); J. P. BULL (Tutbury); E. H. W. PLATT (East Cosham); J. T. ELLIS (Chorlton-cum-Hardy); E. HARPER (East Ham, E.6).

August Photographic Contest.—This competition achieved a record, both in the number of entries and the interesting nature of the photographs submitted.

Competition in both the "A" and "B" sections was very keen and the quality of the winning prints was excellent. Many really good entries had to be passed over when making the awards, which were as follows:—

First Prizes: Section A, J. F. HUSON (Upper Norwood, S.E.19); Section B, B. P. HAY (Glasgow). Second Prizes: Section A, A. KINGSTON (Wolverton, Bucks.). Section B, G. M. LANE (Wakefield).

Consolation Prizes: J. BONTOFT (Isleworth, Middx.); L. A. CORNEY (Portsmouth); J. D. CULVERWELL (Croydon); R. G. DODSWORTH (Pendleton); S. S. ELLAM (Sheffield); B. G. FRANKLIN (Birmingham); R. B. GAZE (Harrow); G. L. NICHOLSON (Ryde, I.W.); H. C. MASON (Ashby-de-la-Zouche); D. R. SHEARS (Bradford); G. H. WOOD (Halifax).

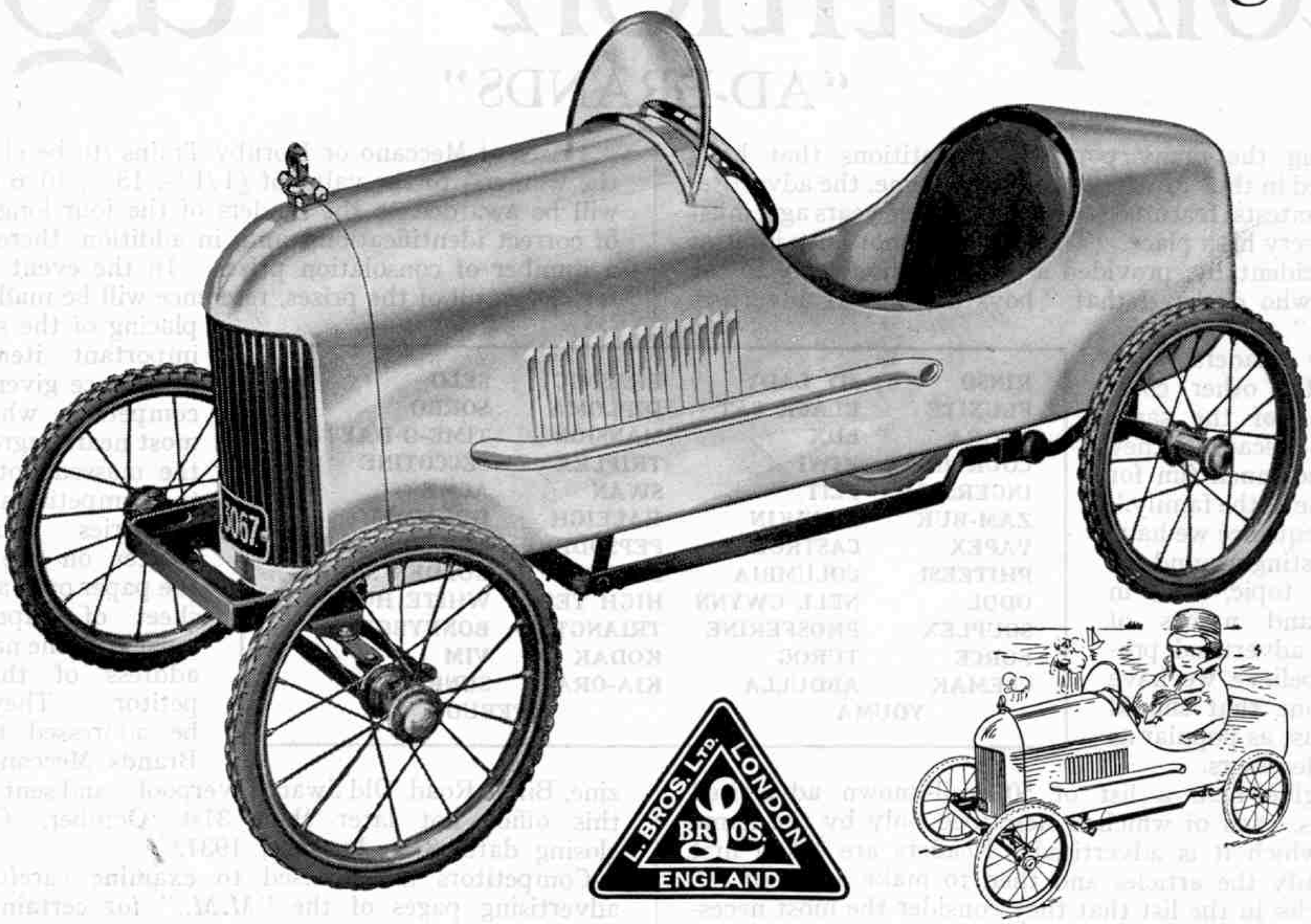
OVERSEAS

April Photo Contest.—First Prizes: Section A, W. E. FARQUHAR (Wellington, N.Z.); Section B, C. J. MCCAIN (Sydney, N.S.W.); Second Prizes: Section A, K. ABOUL-ZAHAB (Beirut, Syria); Section B, D. J. RICHARDSON (Auckland, N.Z.). Consolation Prizes: P. GREGORY (Stamboul, Turkey); C. OMSBY (Norwood, S. Australia); C. R. PARSONS (Sydney N.S.W.); Y. C. YONG (Seremban, F.M.S.).

Football Improbabilities.—1. W. L. BARRY (Christchurch, N.Z.); 2. D. G. TEES (Natal, S.A.); 3. B RICHARDS (Warburton, Victoria); 4. B. FOLEY (Wellington N.Z.).

May Photo Contest.—First Prizes: Section A, J. MORRIS (Wellington, N.Z.); Section B, F. CORSI DI BOSNASCO (Turin). Second Prizes: Section A, J. CREDIE (Cape Town); Section B, R. FRANCIS (Cape Town). Consolation Prizes: J. A. RODRIGUEZ (Montreal) J. W. TANNER (Sydney).

This car is the real thing!



L. BROS. LTD. LONDON BROS. ENGLAND

Yes, it's a Brooklands model car built by Tri-ang engineers. They said: "Let's make this Brooklands car sporty and splendid; let's make it strong—and let's make it *safe*." So they fitted it with a polished aluminium body and radiator and gave it a stunningly smart finish by covering the chassis and wheel rims with brilliant red enamel. Then they fitted it with a ball-bearing back axle, double crank drive and real rubber pedals. And they added that long natty exhaust pipe because they knew you would like it. Now when is your birthday?

BROOKLANDS No. 6 . 63/-
Polished aluminium body, red chassis and wheel rims, tangent spoke wheels with 1″ imitation pneumatic tyres, windscreen, seat padded in red cloth. For ages 4-8yrs.

BROOKLANDS No. 8 . 105/-
As No. 6, but with 2¼″ Dunlop balloon pneumatic tyres, heavy tubes and Schrader valves. For ages 4-8 yrs.

BUICK EMPIRE 95/-
A chain drive motor with every possible detail of equipment. Ball bearing back axle and pedal bracket. Side door opens. Safety glass adjustable screen, balloon wheels. For ages 4-8 yrs.

CHEVROLET REGAL . 32/6
A beautiful car with steel chassis and moulded steel body. Easy running double crank drive with rubber pedals, back axle is ball bearing. Balloon wheels with ⅝″ rubber tyres. For ages 4-7 yrs.

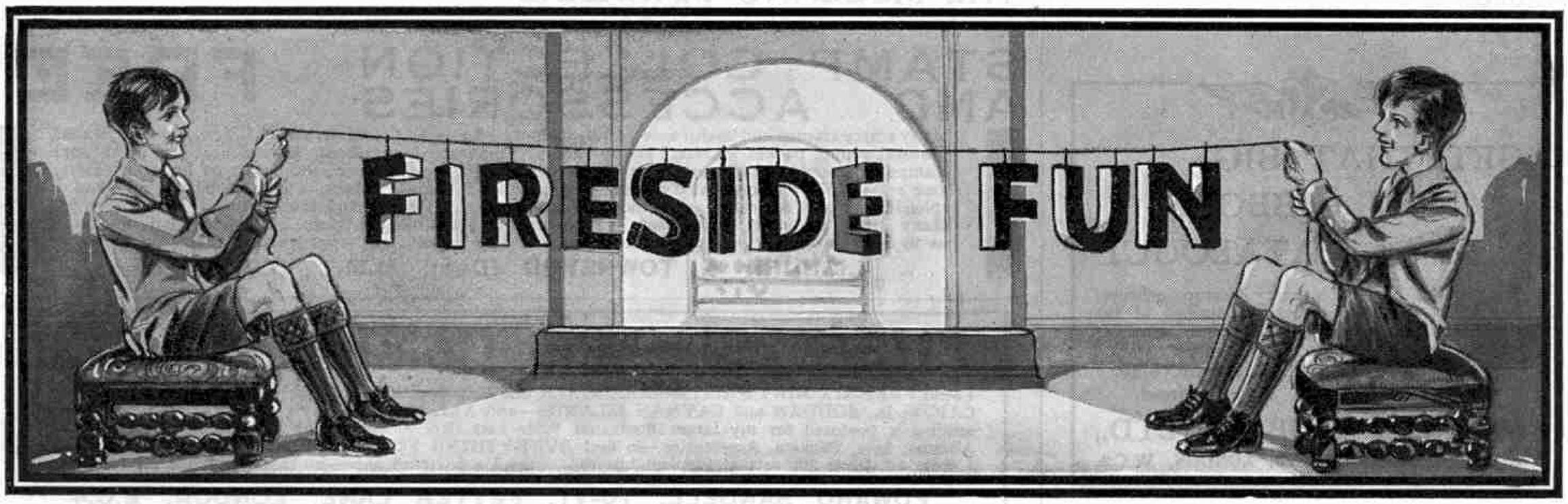
ROVER REGAL 42/-
All steel body is mounted on steel chassis with four cantilever springs. Model of Rover radiator with correct badge gives a very handsome appearance. Full complement of accessories is included. For ages 4-7 yrs.

TRI-ANG
MOTOR CARS 15/- TO £15-15-0

Count them on the pavement!

★ Tri-ang cars are on view at most Toy shops. Write for folder of Tri-ang Cars and other Tri-ang Toys, illustrated in full colours. **Free on request.**

LINES BROTHERS LIMITED, MORDEN ROAD. LONDON. S.W. 19



SAFETY FIRST

During the final days of the war a sergeant in a native regiment ordered a newly-arrived private to go into a dug-out and clean out any Germans that happened to be there.

The nigger blanched a bit, and made ready to enter. Before doing so he turned to his comrades and said huskily, "Ef yo' sees three or fo' men cum a runnin' out ob dat hole, don't shoot de fust one!"

* * * *

Bob: "I'm thirsty, and I want a drink."
Tom: "Have a glass of milk; It's good for the blood."
Bob: "Yes, but I'm not bloodthirsty."

* * * *

"Is this an interesting book?" asked Grandma of the librarian.

"Well, it depends on what you call interesting," was the reply. "There are three murders in the first chapter."

"Oh, that's all right," she said. "I like a book with a bit of life in it."

* * * *

"Gentlemen," said the professor, "this is one of the most dangerous experiments known to science. The slightest mishap and the experimenter will be blown to atoms. I will now step into the next room while my assistant performs the experiment."

* * * *

Scoutmaster (on overnight hike, examining beds constructed by Scouts): "This is a three-season bed."
Scout: "How's that?"
Scoutmaster: "No spring."

* * * *

Jack: "Let's have some ginger ale."
Bill: "Pale?"
Jack: "No, an ordinary glass will be big enough."

* * * *

"How do ghosts get in houses?"
"With skeleton keys, of course."

* * * *

ALREADY PROVIDED



Mr. Smith had just finished putting the seeds in the garden.

"How about the birds eating the seeds?" queried Mrs. Smith. "Hadn't you better put up a scarecrow?"

"Oh, that doesn't matter," was the reply. "One of us will always be in the garden."

* * * *

"Your father's snow-white hair gives him a very distinguished appearance," said the elderly man.

"Ah, yes," agreed the wild son, proudly. "He's got me to thank for that."

* * * *

"Do you know how to find the horsepower of a car?"
"No."
"Easy—just lift the hood and count the plugs."

* * * *

"I have an awful lot of electricity in my hair."
"I don't doubt it. You have such shocking things always on your mind."

AN EASY SUM

Girl: "We want to buy a ticket."
Ticket Agent: "But there are two of you."
Girl: "Well, we're half-sisters, Add that up."

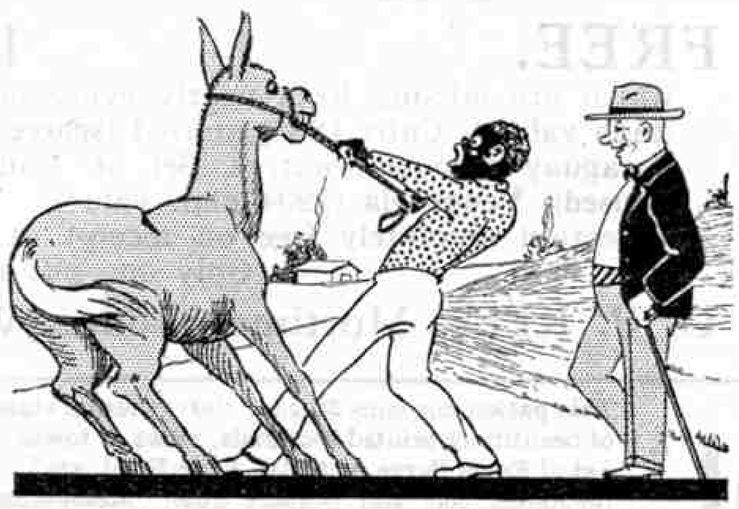
* * * *

While an old man was fishing in a large creek, a stranger accosted him and inquired: "How are the fish to-day, old man?"

"Well, sir," he drawled, "I don't know; I dropped 'em a line but got no reply."

* * * *

ITS WONTED OBSTINACY



A darky was struggling with a mule that was more than usually obstinate.

"Where's your will power, Rufus?" called out a bystander.

"Mah will power am right wid me, but you oughta see dis yer animal's won't power!"

* * * *

Oculist: "Has your little girl got used to her glasses?"
Mother: "There is no means of making her wear them all day, but fortunately I manage to slip them on as soon as she falls asleep."

* * * *

A choir-boy's letter to his vicar: "We are forming a cricket team and would be grateful for your financial assistance. Also, could we have the use of the bats which the verger says you have in the belfry?"

* * * *

Rastus: "That hoss ob mine am de fastest hoss in de worl'. He can run a mile a minute 'cepting foh jest one thing."
Sambo: "What's dat?"
Rastus: "De distance am too long foh de shortness ob de time."

* * * *

The guests were just going into supper when a small voice was heard to ask:

"Have we any touchy custard for supper?"
2nd Voice: "What do you mean, 'touchy custard'?"
1st Voice: "Custard upset over a trifle."

* * * *

A gentleman was visiting a prison when he saw a convict sewing mail-bags.

"Ha!" cried the gentleman to the prisoner, "sewing, my man?"
"No," was the reply. "Reaping!"

* * * *

A lady motorist whose car had swerved across a street and crashed through a plate-glass window was being questioned by the police-sergeant.

"Surely on a street as wide as this," he said in amazement, "you could have done something to prevent this accident?"

"Oh, I did!" the lady assured him tragically. "I screamed as loud as I could."

* * * *

"If you haven't a doctor," said the tourist at the village inn, "what happens when anyone is taken seriously ill?"

"Oh, they just dies a natural death."

* * * *

She (anxiously): "Why are you going so fast?"
He: "The brakes won't work, so I want to get home before we have an accident."

ONE OF THE FAMILY

"Jimmy, I wish you'd learn better table manners; you're a regular little pig at the table."

Deep silence on Jimmy's part.

"Jimmy, do you know what a pig is?" continued father, wishing to make his reproof more emphatic.

"Yes, dad," replied Jimmy meekly, "It's a hog's little boy."

* * * *

Teacher was trying to make her bright young pupils grasp the meaning of the word "perseverance."

"What is it," she said, "that carried an explorer over rough roads and smooth roads, up hill and down dale, through forests and swamps, deserts and raging rivers?"

One hand had shot up half-way through, but now it came down again.

"Come, Johnnie," said teacher encouragingly, "I'm sure you were going to tell me. What is it?"

"Well, miss," said Johnnie, "I was going to say 'A Ford' until you got to that last bit, but I'm beat there!"

* * * *

The Inquiring One: "I understand that your father is ill. I hope it is nothing contagious."
The Lazy One: "I hope not. The doctor says it is overwork."

* * * *

John: "What shape is the earth?"
Johnny: "Square."
John: "Why do you say that?"
Johnny: "Well, my father was a sailor, and he said he had sailed to the four corners of the earth."

* * * *

A boy punctuated his composition very poorly. He was disgusted with it and one day handed in his essay with a string of dots and dashes at the end of the paper.

"What are those marks for?" the teacher asked.

"Oh those are the punctuation marks," replied the boy. "Put them in to suit yourself."

* * * *

A POOR JOKE!



A works manager making his rounds of the factory, came across a boy whom he had dismissed on the previous day.

"What are you doing here?" he shouted. "Didn't I order you to get out yesterday?"

"Yes, you did," said the boy, "and don't you play that sort of joke on me again. I got into real trouble about it when I told my people."

* * * *

"Willie," said the Sunday school teacher, severely, "you shouldn't talk like that to your playmate. Had you ever thought of heaping coals of fire on his head?"

"No, ma'am, I hadn't, but it's a peach of an idea!"

* * * *

Stern Parent: "When I was a boy I thought nothing of a ten-mile walk."
Modern Son: "I don't think much of it myself."

* * * *

Hotel Guest: "Do you know that two mice were fighting in my room when I woke up this morning?"
Room Clerk: "Well, what do you expect for five and sixpence—a bullfight?"

GET THAT BIG NEW GIBBONS' CATALOGUE

This is the one book every stamp collector wants. It lists and prices the stamps of the world, with full-size illustrations and details of what they represent. **A wonderful book!**

Whole World, 15/9. Br. Empire, 6/10.
Post Free in U.K. Extra Abroad.

STANLEY GIBBONS LTD.,
DEPT. S.15, 391 STRAND, LONDON, W.C.2.

SETS (POSTAGE EXTRA)

10 Brazil	...	3d.	20 Roumania	...	2d.
15 „	...	6d.	25 „	...	3d.
20 „	...	9d.	30 „	...	4d.
25 „	...	1/-	20 Poland	...	2d.
30 „	...	1/4	25 „	...	3d.
35 „	...	1/9	30 „	...	4d.
40 „	...	2/6	20 Czecho	...	2d.
10 Cuba	...	3d.	25 „	...	3d.
15 „ ...	...	5d.	30 „	...	4d.
20 „ ...	...	9d.	20 Greece	...	3d.
25 „ ...	...	1/-	25 „	...	4d.
30 „ ...	...	1/4	30 „	...	6d.
35 „ ...	...	1/9	20 Turkey	...	3d.
40 „ ...	...	2/6	25 „	...	4d.
10 Algeria	...	3d.	30 „	...	6d.
15 „	...	6d.	5 Peru ...	...	3d.
20 „	...	10d.	10 „ ...	...	7d.
			15 „ ...	...	1/-

J. RUSSELL,
Chetwynd, Shanklin Drive, Westcliff-on-Sea.

STAMP COLLECTION AND ACCESSORIES FREE!

Many scarce stamps and useful accessories, such as:—5 unused Colonials, an old U.S.A., an over printed pastoral stamp, packet "Liver" stamp hinges, Transparent envelopes, Agricultural and Zoological stamps, fine set of 10 different Canadian including Q.V., an old Japan, and a pair of metal tweezers, long sets of Mint stamps, also a magnificent set of 3 Cochin Rajahs, a Chinese ship stamp and a splendid set of 8 Africans. A wonderful opportunity. Finnish and Hungarian Hivalatos stamps. Many British Colonials, also a useful gummed set of Titles of Countries—A-Z. Space will not allow us to describe further. Send 2d. postage for this packet and approvals, and see for yourself.

LISBURN & TOWNSEND (Dept. M.M.), LIVERPOOL

FREE Six Mint Colonials FREE

I send FREE SIX MINT BRITISH COLONIALS, one each from KEDAH, ZANZIBAR, Kenya, TURKS & CAICOS Is., SOUDAN and CAYMAN ISLANDS—and ALL MINT, to any collector at Home or Abroad sending a postcard for my large Illustrated Price List (No. 9) containing over 1,200 items: Stamps, Albums, Sets, Packets, Accessories—in fact EVERYTHING FOR THE STAMP COLLECTOR. Prices from 1d. (over 200 sets at 1d. each) to 40/-. Send a postcard only—no cash—and ask for No. 200.

EDWARD SANDELL, 10-11, FETTER LANE, LONDON, E.C.4

Vatican Packet FREE!

A fine packet of **All Different Stamps** containing the new issue of the **Vatican State, a Jamaica 2/-, Hayti** 1904 Centenary **Cat. 9d., Medellin** 1913 Unused pictorial, **Indore, Cilicia** surcharged **Cat. 3d., Central Lithuania, Deccan, Lebanon, Kouang-Tcheou, Bulgaria** pictorial, **St. Pierre and Miquelon, Victoria** 1901, etc., **free to all** asking to see my famous approval sheets and **enclosing 2d. for postage and packing (abroad 3d.).**

S. HAMMOND, 2, CHESHAM FIELDS, BURY.

FREE. 12 SCARCE STAMPS

which are missing from nearly every collection, and include Austrian Field Post (**high values**), Cuba 1898, unused (**scarce issue**), Set of 3 Hungary (**unusual values**). **Paraguay** Commemorative, Set of Philippine Is. (**Boy King**), Switzerland (1882 **unused**), **Venezuela** (1904 high value). To all stamp collectors I will present this collection **absolutely free** on receipt of 1½d. stamp for postage. (Abroad 2½d.). Only one gift to each applicant.

G. P. KEEF, Mortimer Lodge, Wimbledon Park, London, S.W.19.



THE "ORIENTAL" PACKET

This packet contains 30 *good class* **Oriental stamps** only (no common continentals) and is mostly comprised of beautifully printed pictorials, **views** of towns, ruins, mosques, minarets, gateways, etc. Set of **Palestine.** Set of **Egypt** (large pictorial, King Fuad, etc.). Set of **Turkey** (including "**Wolf**" type). Set of **6 Algeria** (including 50c. and postage due). **Mesopotamia** (large pictorial). **Syria** (pictorial). **GRAND LIBAN** Pictorial (surcharged with Aeroplane for Air Service). Set of **3 Persia** (obsolete). **ALAOUITES** (Minaret). Set of **8 Tunis** (new issue, pictorials, postage due, etc.). **Price 4½d.** only, postage 2d. extra (abroad 2½d. extra). **Purchasers** of the above packet asking for approval sheets will be presented with a unique set of **10 PICTORIAL MOROCCO**, including Air post. This *fine* set is usually sold at a 1/-. Satisfaction guaranteed or money returned. Senders of addresses of stamp collecting friends will receive another set in addition **FREE.**

H. C. WATKINS, M.M. Dept., Granville Road, BARNET

Stamp Albums FREE!

Size 8×6 ins. 88 Pages.
NEW EDITION.
Holds 2,200 Stamps.
Send 6d. (abroad 1/-) to cover postage and packing.

The above are given entirely as an advertisement.

AMBER & WRIGHT (Dept. A), 33, Waveney Avenue, Peckham Rye, London, S.E.15.

JAMAICA PACKET FREE

This **Excellent Packet** contains **482 Guaranteed Unsorted Foreign Stamps** as imported from **Abroad,** including **Set** of **Jamaica** with scarce 1/- **Queen Victoria** and **War Stamp,** scarce **Bolivia,** obsolete **Gold Coast, Cape of Good Hope,** unused **British Morocco,** &c., &c. **Free** to Genuine applicants asking for **Half Price** Approval Sheets and enclosing **2d.** postage. (Abroad 8d. P.O.). Mention Jamaica.

HORACE MILLER & CO., WHITSTABLE, KENT.

SPAIN. AIR STAMPS.

A new pictorial set of these handsome stamps sent free of charge to bona-fide applicants for selections of duplicates on approval. Enclose 2d. for postage. 500 different stamps (extra good), post free, 1/6.

HENRY TURNER,
110, Barnett Road Preston Brighton, SUSSEX.

STAMPS FOR THE NATION!

Junior Guaranteed AGENTS still WANTED in Schools and Districts to MAKE MONEY.
Why not write for details and join? It will cost you nothing!
You will soon be sending testimonials like the following just received. "Thanks for the Free 5/- Collection. Only two of the stamps are already in my collection, so it makes quite a useful addition." (Birmingham). "Please forward another Selection as the last was so good." (Oxford). "I find your approvals very interesting, so please forward another Selection." (Exmouth), etc., etc.
Join now to be ready for the new season.
Each new J.G.A. this month has a choice little lot value 5/- presented free by our Chairman.
THE NATIONAL STAMP ASSOCIATION LTD. (Collectors). Correspondence only.
30a, HIGHGATE ROAD, LONDON, N.W.5.

CHEAP OFFERS IN UNCOMMON AIR STAMPS

BELGIUM: 1930 Beautiful pictorials, set of 4	1/6	PAPUA: 3d. Air Mail, scarce	6d.
SWEDEN: 1930, 10 and 50 ore, Night plane	1/-	INDIA: 6a, 9d.: 8a, 1/-: 12a	1/6
CANADA: 5c. brown, fine allegorical design ...	4d.	SALVADOR: Correo Aereo, 20c. rare provisional issue, fine used	1/-
AUSTRALIA: 3d. green, Air Mail Service ...	4½d.	SALVADOR: Correo Aereo, 40 c. rare provisional issue, fine used	1/6
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VICTOR BANCROFT, MATLOCK, ENGLAND.



AIR MAIL NOTES

South Africa's Air Mail History

Although the present South African air mail service was only opened at the end of August last year, the first mail flight in this Dominion—between Kenilworth and Muizberg, two towns near Capetown—took place as long ago as 30th December, 1911. Special cards were issued, bearing a picture of a monoplane of Bleriot type (presumably the machine employed to carry the mail) and an appropriate inscription. Most of the cards, which are now worth about four guineas, were used to convey New Year greetings, and "my good fortune in re-discovering one two



years ago," says our reader, Mr. A. E. Davis, to whom we are indebted for interesting information on South African air mails, "leads me to think that there may be other unknown specimens stored away in forgotten cupboards with other compliments of the season."

A few flights in October, 1918, in aid of Red Cross charities marked the next stage in the development of South Africa's air mails, and it was not until 2nd March, 1925, that the Dominion's first regular service was inaugurated, this being over the route Capetown-Oudtshoorn-Port Elizabeth-East London-Durban, a total distance of 950 miles. Single-engined biplanes from the Active Service Bombing Squadron of the South African Air Force operated the service, and a set of four large stamps of pleasing appearance was printed in Pretoria on unwatermarked paper for use on mail carried by the machines. Delivery of mails to eastern cities from Europe and Capetown, and vice versa, was considerably expedited, and there was no serious accident to any machine, although a few minor delays occurred. Unfortunately, sufficient support was not forthcoming to make the service a success, and it was abandoned on 15th June of the same year.

During the three-and-a-half months of operation, the pilots covered 107,293 miles in 1,065 flying hours. The cost of maintaining the service was £10,500, but owing to public apathy the revenue was only £4,000.

The service now operated by Union Airways Ltd. covers the same route, omitting the call at Oudtshoorn, and takes in also a branch line from Port Elizabeth up to Bloemfontein for Johannesburg. This service was opened on 26th August last year and employs five de Havilland Moths—two coupés and three open machines. In connection with its inauguration the Post Office made another, but less successful, venture in air stamp production, two varieties being issued (4d. and 1/–) which quite accurately, but plainly, depict a two-seater Moth in flight.

The moving spirit in the formation of Union Airways was Major Allister M. Miller, D.S.O., M.L.A., a pioneer pilot, who recruited several hundred airmen in the Dominion during the Great War, and, in 1927, imported South Africa's first Moth. He inaugurated the service by flying from Capetown to Port Elizabeth, where the mail was trans-shipped, or, rather trans-planed, Mr. Casparatheus taking one 'plane on to Durban and arriving nearly two hours before time. The final stage of the journey was unfortunate, however. Lieut. Bellin, who set out for Bloemfontein and Johannesburg, met with such strong winds that he was nearly an hour late at the former city, and, as "night was drawing nigh" when he arrived, the mail bags were sent on by train to Johannesburg.

A further chapter in South African air



mail history is opened by the recent announcement that Imperial Airways' new service between London and Cape Town will come into regular operation on 1st January, 1931.

Further details of this new service will be given as soon as full data is available. In the meantime, readers who are desirous of securing special envelopes for use in sending mail on the first flight should apply to Imperial Airways Limited, Airways House, Charles Street, Lower Regent Street, London, S.W.1. The charge for the envelopes is 1/– per dozen.

New Air Mail Issues

A new value has recently been added to the Swiss air mail series, the design being as shown in the accompanying illustration. The design is symbolical of the great speed of air mail delivery.

Another air mail stamp of particular interest is France's first definitive issue, to which reference was made in our Stamp Gossip Notes for January last. The design shows a monoplane flying over Marseilles Harbour with Notre Dame de la Garde in the background at the left of the stamp. An interesting feature of the design, having in mind the new Swiss issue, is the swallow-like bird, also with a letter in its beak,

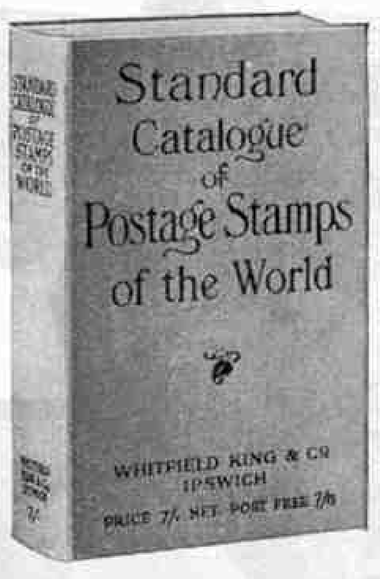


that has been introduced into the descriptive tablet in the bottom left hand corner of the stamp.

An illustration of Iceland's air mail stamp is also available this month, this being the design to which reference was made in our article on the Icelandic Parliament Millenary in the May Stamp Notes. It will be observed that the Millenary dates are incorporated in the design, while in each of the four corners a design emblematic of the ancient history of the island is embodied. This stamp is one of a set of five issues, the remaining values being 20, 35 and 50 aurar and 1 Kr.

Paraguay's new air mail series also appeared recently. It contains only three values—2p.85, 3p.40 and 4p.75, and is distinctive by reason of its design, which shows the scene at the declaration of the independence of Paraguay, aerial scenes, actual or symbolical, being omitted entirely. The illustrated design is used for each of the three stamps.

The Republic of Great Lebanon is also preparing a new air stamp set, but as yet only the 5 piastre value has appeared. This shows a biplane flying over a strip of Lebanese coastline. We understand that the set when complete will be a long one.



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GREAT BRITAIN, K.G., ... 5/- 9d., 10/-	2/-
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On the Footplate of the "Schools"

(*Continued from page 773*)

Morris as his mate. I was soon to have new proof of what I had known before—that no two engines of the same class are exactly alike, and that two runs over the same route on the same day may be marked by very different features. As soon as "*Sherborne*" moved a slight "knock" was perceptible, and it could still be discerned at speed. The coal for this up journey was of decidedly poorer quality than that provided for the down; it was fine slack and as the fireman remarked "not fierce enough" to maintain readily a full head of steam. Then again the side wind that had been favourable to us on the way down was now strongly against us, and at times it caused the smoke and steam to drift down upon the cab. The greatest hindrance to a speedy and punctual run, however, lay in the fact that special race traffic congested the line and prevented our getting a clear road for the latter half of the journey. For the first half of the trip driver and fireman triumphed over the other difficulties, and "*Sherborne*" did some very fine running. For the up journey the load was slightly less than the one we had coming down, consisting of nine bogies instead of ten, totalling 279 tons empty and 315 full.

It was 1 min. 20 sec. after 5 p.m. when we started from Folkestone. Only the small valve of the regulator was opened and within a few moments the reversing gear was brought back from full forward to a cut-off of 46 per cent., at which it was kept for the ascent of 1 in 265 to Sandling and to Westenhanger beyond. Up this long bank careful firing was necessary to maintain 200 lb. pressure of steam. The 5.9 miles from Folkestone to Westenhanger occupied 9 min. 35 sec. Now for a while we had done with climbing, and favourable grades lay ahead. The cut-off was brought back to 16 per cent. and soon we were revelling in the luxury of swift travel. Opposite Smeeth I wrote in my journal "Speeding"; a minute or two later I wrote "Galloping"; and truly we were. To such purpose did we run that the 29.3 miles from Westenhanger to Paddock Wood were done in 24 min. 40 sec., giving an average speed of more than 71 m.p.h. The 2½ miles from Staplehurst to Marden were ticked off in precisely 2 min., that is at 75 m.p.h., and near Headcorn I timed one half-mile in 22 sec., which means 81 m.p.h. By Marden we had bettered "even time," having covered the 30.6 miles from Folkestone in 30 min. 30 sec.; while Paddock Wood 35.2 miles from the start was passed in 34 min. 15 sec.

Now our troubles began. As we approached Tudeley Box signals were "on," and after that it was signals all the way. At Tudeley they came "off" just in time to save us stopping, but at Tonbridge we found them "on" again. We were still moving, however, when we got the "line clear," and away we went to face the climb to the summit at Sevenoaks. The cut-off was lengthened to 46 per cent., and as we breasted the 1 in 122 the regulator was opened beyond the small valve. At the Weald Box the distant signal was "on" and the engine was eased, but as the home signal came "off" she was extended again as she continued the climb at 1 in 144 through the Sevenoaks Tunnel. Sevenoaks Station, 7½ miles from Tonbridge, was passed in 13 min. 25 sec. Falling grades now brought rising speed, but more signal checks followed and we came almost to a stand before entering Polhill Tunnel. Immediately the way was clear the driver swung ahead again and, accelerating rapidly, we were doing 70 m.p.h. at Orpington. Permanent way relaying was in hand at Chislehurst, and necessitated a prolonged slack; and we had just got nicely going again when, on emerging from Elmstead Tunnel, we found signals against us and were reduced once more to the merest crawl. At Grove Park, Hither Green and New Cross distant signals were "on," and we could proceed only with caution. When we came among the colour-light signals we got a succession of yellows, and not until St. Pauls and the Tower Bridge came in sight did we get our first green signal. It was then too late to get going again, but we had a clear run over the final stages into Charing Cross, where we arrived 13½ min. late. It says much for the capabilities of the engine and the dogged enterprise of Driver Weaver and his fireman that in spite of such a heart-breaking series of checks we had taken only 12 min. more than the tight schedule time from Folkestone to London. In the earlier stages "*Sherborne*" had shown her paces, and it is an interesting speculation how many minutes early we might have arrived if only a clear road had been possible.



Stamp Gossip

and Notes on New Issues



The Sturt Commemorative

Australia's latest stamp issue, commemorating the centenary of Captain Charles Sturt's first exploration venture in the Murray River district, was issued on 2nd June and, as our illustration shows, it is well up to the high standard of recent Australian efforts.

Captain Sturt's first venture resulted in the discovery of the Darling River. On a second trip a year or so later he located Lake Alexandrina, but the privations endured during the journey completely undermined his health, and his sight commenced to fail. Despite this handicap he remained in charge of the expedition, and in 1844 organised and led still another exploration party. In the course of this his sight failed completely and he returned, a broken man.



In 1851 Captain Sturt returned to his mother country, England, and died ten years later at Cheltenham.

The issue comprises two values, 1½d. red and 3d. blue.

1931 Pro Juventute Issue

The design for the ever popular Swiss "Pro Juventute" Charity issue for this year will be as follows:—5c., Arms of Freiburg; 10c., Arms of Altdorf; 20c., Arms of Schaffhausen; 30c., Portrait of Jeremias Gotthelf, the Swiss novelist.

The issue is expected to appear on or about 1st December.

Persia's Definitive Air Mails



Persian stamps of recent years have made a strong appeal to collectors by reason of the beauty of their colouring and production, and the recently issued definitive air mail series lacks nothing in comparison with the country's general issues.

The series comprises 17 stamps, 1, 2, 3, 4, 5, 6, 8, 10, 12 and 15ch., 1, 2, 3 and 5 Krs. and 1, 2 and 3T. The design illustrated is employed throughout the series, the 11 low values being in photogravure and the remaining higher values recess printed.

A Close Shave

A highly interesting change of design appears in the latest printings of Turkish high values. Mustapha Kemal Pasha, as will be seen in our illustration, has shaved his moustache and faced about.

This is the second variation from the 1926 design, the previous alteration being the substitution of Roman characters for Arabic in the identification tablet and in the right hand value tablet, this revision, with the alteration of currency description from grouch to kurus, having been made late last year.



As a matter of interest we reproduce both the original 1926 design, and the newest rendering; the original, lest there should be doubt, can be identified by a light scoring line through the value tablets.

New U.S. Commemorative

A specimen of the latest U.S. commemorative reaches us just as we go to press. In size, colour and perforation it follows exactly the style of its predecessors, and even the design is more than faintly reminiscent of all other recent U.S. commemoratives.

On this occasion it is the battle of Braddock's Field that is commemorated. This battle was fought in 1755 and the British General, Braddock, was defeated and killed by a combined force of French and Indians.

A curious feature of the stamp is that the design does not show Braddock himself, but a statue of the great George Washington that has been unveiled recently in the town that bears the British general's name. The connection may seem obscure, until it is explained that Washington was a member of General Braddock's staff, and that the future American leader rendered great service during the disastrous fight. The only portion of Braddock's army to offer effective resistance was the Virginian contingent, and with this Washington fought stoutly, preventing the battle from ending in the complete destruction of the British force. He was the only leader to emerge from the disaster with credit.

A Stamp Murder

Those of our stamp collecting readers who are fond of a "thriller" will find a stamp calculated to satisfy their most bloodthirsty instincts in Italy's latest commemorative series, the designs from which we hope to illustrate next month.

The series commemorates the 400th anniversary of the death of Ferrucci, the great Florentine warrior, who met his death in 1530 while at the head of a tiny army of 4,000 men who were contesting the attempts of Pope Clement VII and Emperor Charles V to re-instate the Medici on the throne of Florence, from which they had been deposed a few years previously.

Ferrucci, mortally wounded, fell into the hands of his great enemy, Maramaldo, who in accordance with the barbaric customs of those "good old days," promptly put him to death. The murder scene is shown on the 25c., 50c., and 1 lire 25c. values.

Rush on Roumanians

One of the features of stamp collecting in recent months has been the big speculative

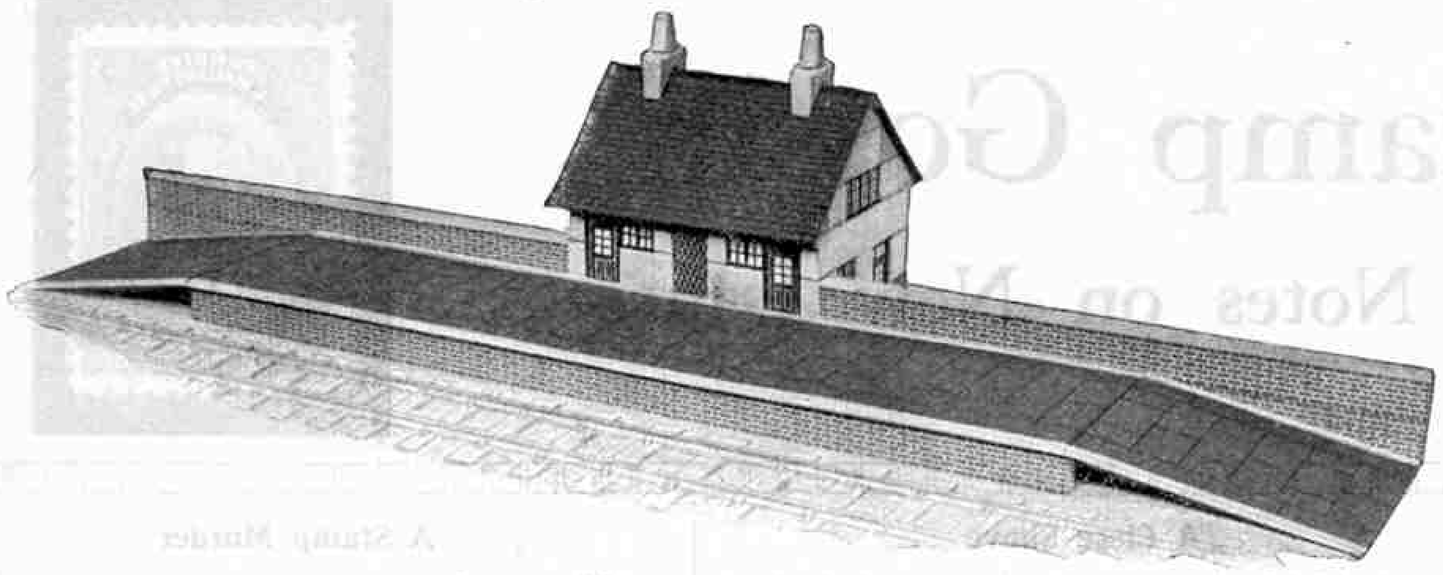


buying of Roumanian issues bearing the portrait of the boy King Michael, overprinted with the date "8 Iunie 1930" in celebration of the *coup d'etat* achieved by the new King Carol, who has now assumed the sovereignty that earlier in life he had renounced in favour of his young son.

Roumania's air mail issue, postage dues and official stamps, with certain minor exceptions, have been overprinted with the same inscription.

It is anticipated that a new issue, bearing a portrait of King Carol, will appear this month.

We take this opportunity of making acknowledgment to Stanley Gibbons Ltd., for their courtesy in loaning the stamps from which the illustrations used in our stamp page have been prepared.



The Station is 35" long, and is built with coloured design bricks as contained in the Lodomo Sets.

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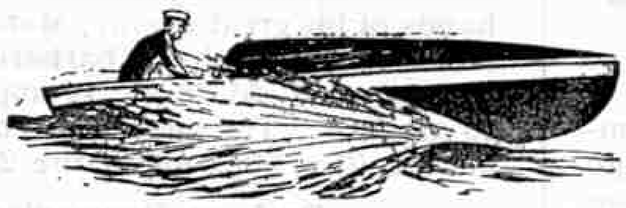
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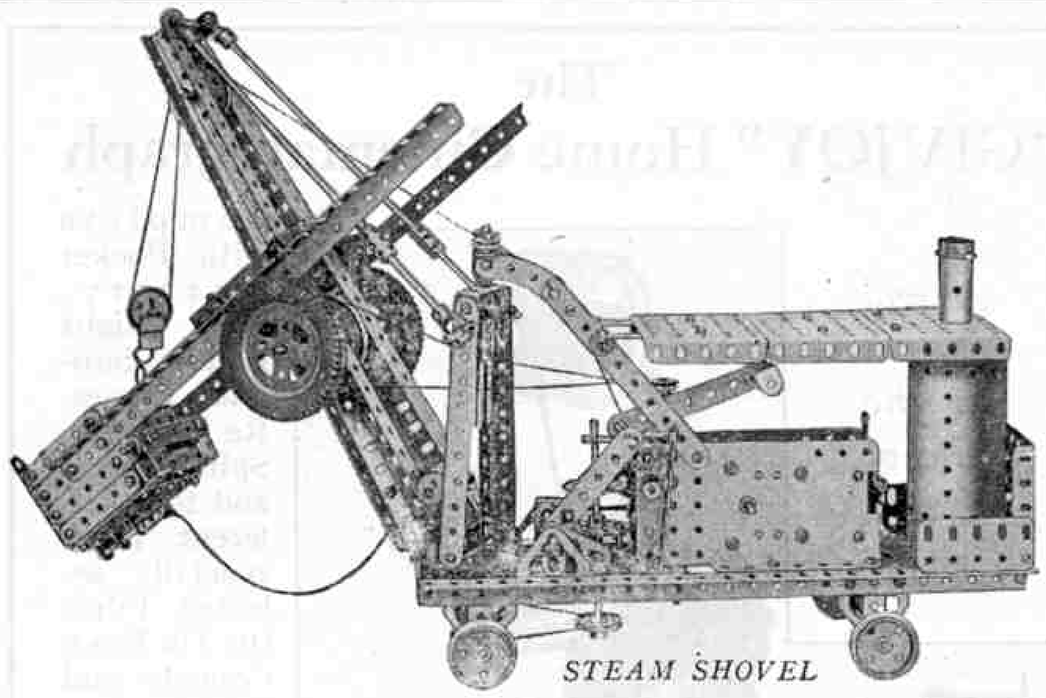
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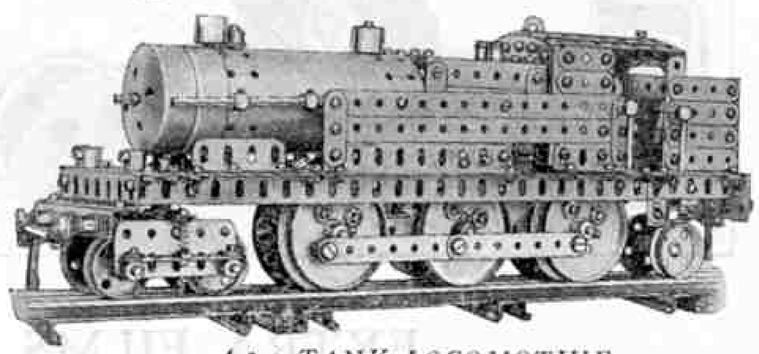
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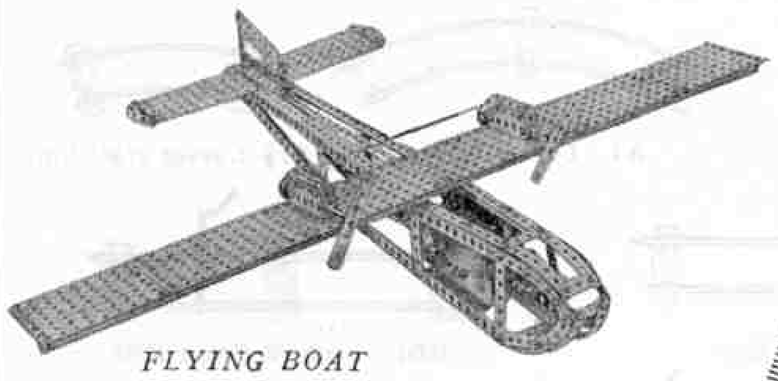
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STEAM SHOVEL



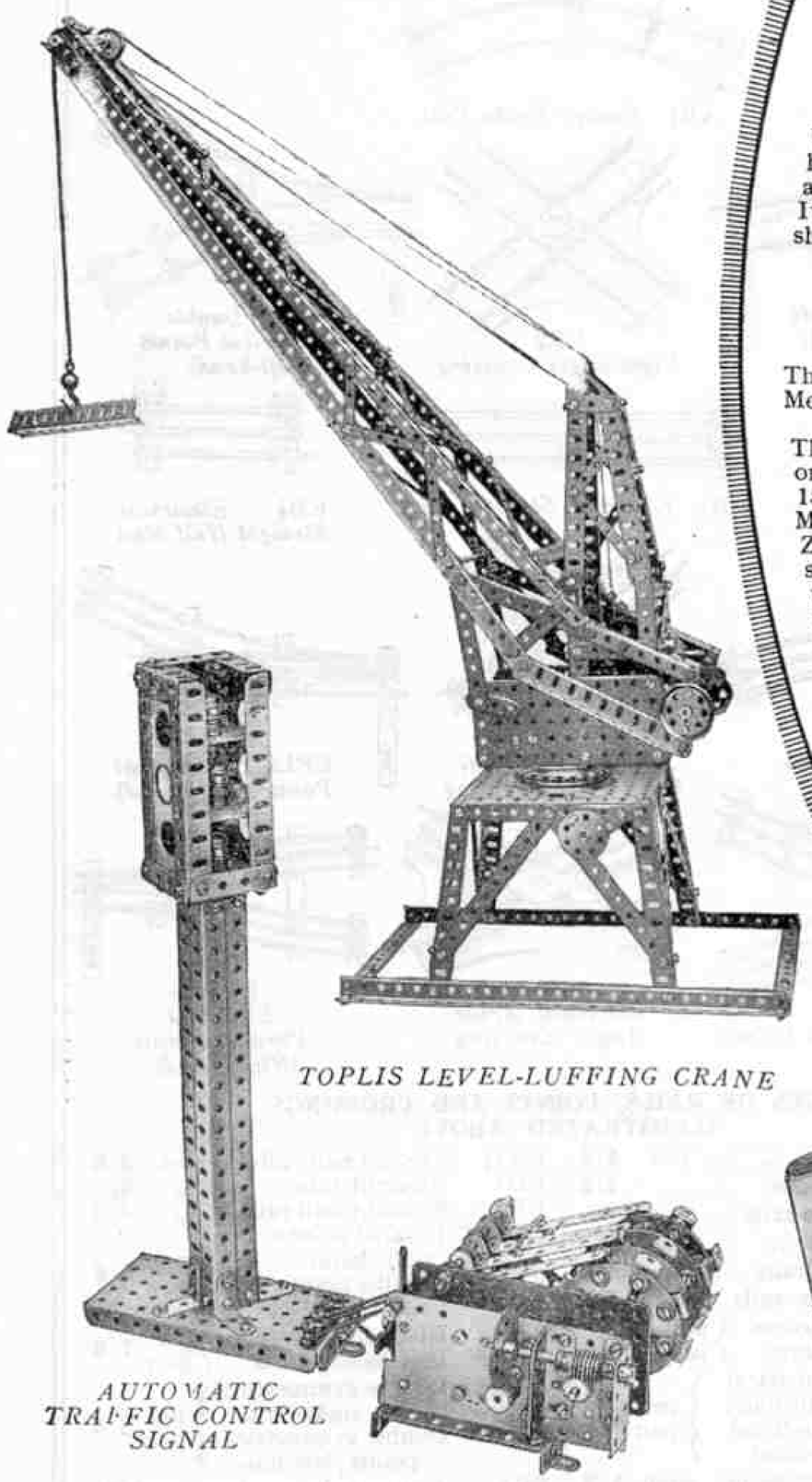
4-6-2 TANK LOCOMOTIVE



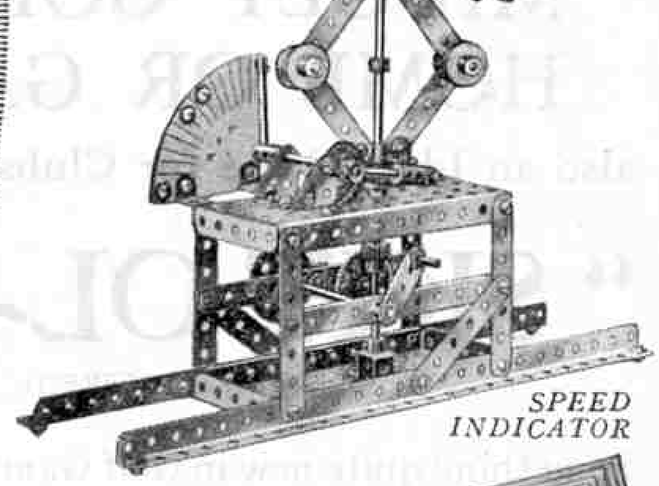
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We advise every keen Meccano boy to obtain his copy of the Book of New Models as early as possible, while a plentiful supply is available. It should be mentioned specially that the models shown in the book are supplementary to the models shown in the Instruction Manuals.

How to Obtain the Book

The 1930 Book of New Models may be obtained from any Meccano dealer, price 6d., or direct from Meccano Ltd., Old Swan, Liverpool, price 7d. post free.

There is a special Overseas edition, price 9d. from dealers or 10d. post free from the agents (Canadian prices—15 cents from dealers, or 20 cents post paid, from Meccano Ltd., Toronto). Readers in Australia, New Zealand, South Africa or Canada who require copies should apply to their dealers or should address their orders to our agencies as detailed below. Readers living in countries other than those mentioned should order from Meccano Ltd., Old Swan, Liverpool, sending a remittance of 10d. with their order.

Australia : E. G. Page & Co., 52, Clarence Street, Sydney (P.O. Box 1832K).

New Zealand : Models Ltd., Kingston Street, Auckland (P.O. Box 129).

Canada : Meccano Ltd., 34, St. Patrick Street, Toronto.

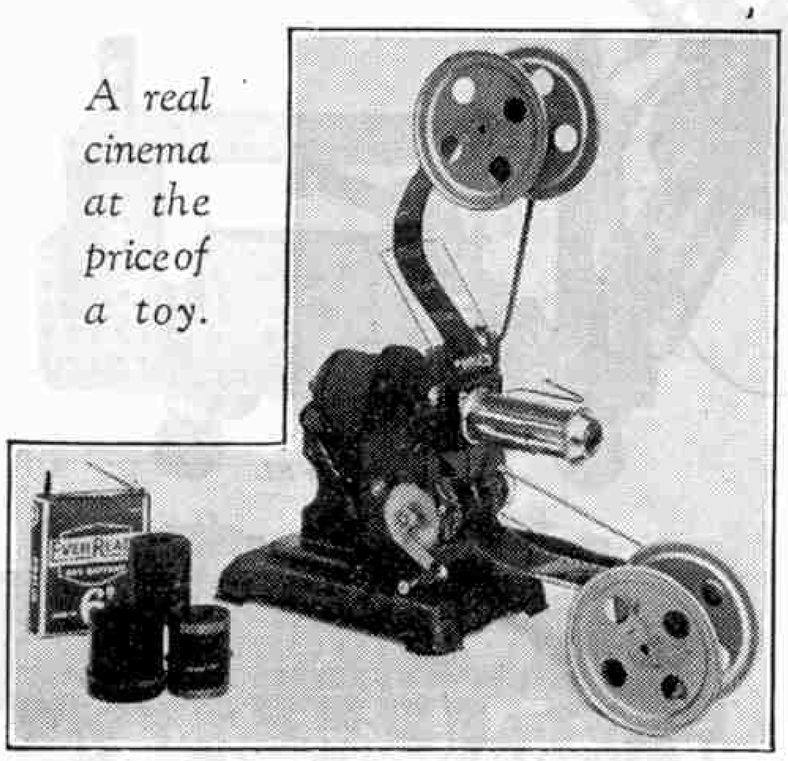
South Africa : Arthur E. Harris, 142, Market Street, Johannesburg (P.O. Box 1199).



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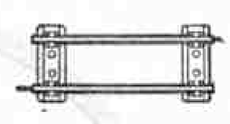
Rails, Points and Crossings

Gauge 0, 1¼". Hornby Series. Alternate Pegs.

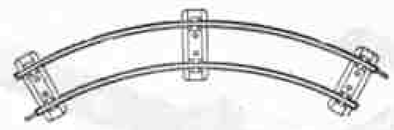
Hornby Rails, Points and Crossings are built for hard wear and for smooth running. They are made of the finest materials and hold together rigidly and strongly, for real workmanship is put into them. Note the great superiority both in quality and appearance of the Hornby rails, etc., a few of which are illustrated below.

There is practically no limit to the number of rail formations that may be built with Hornby Rails, Points and Crossings. A number of very interesting layouts is illustrated in a booklet that we have published, entitled "How to Plan your Hornby Railway." The booklet is obtainable from your dealer, price 3d., or from Meccano Ltd., Old Swan, Liverpool, price 4d., post free.

A SELECTION OF RAILS, POINTS AND CROSSINGS FOR CLOCKWORK, STEAM AND ELECTRIC TRAINS



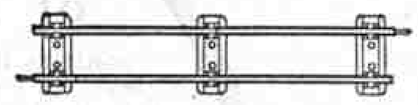
B½ *Straight Half Rail*



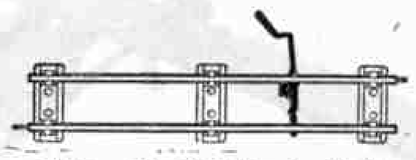
A1 *Curved Rail*



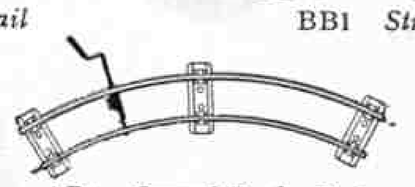
A1½ *Curved Half Rail*



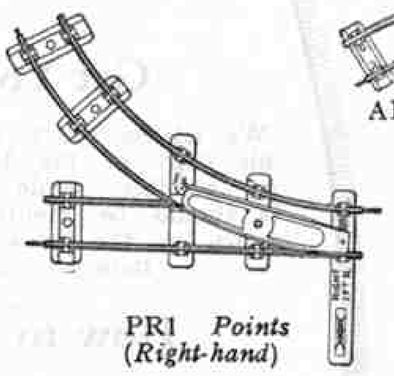
B1 *Straight Rail*



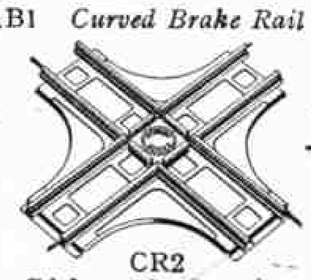
BB1 *Straight Brake Rail*



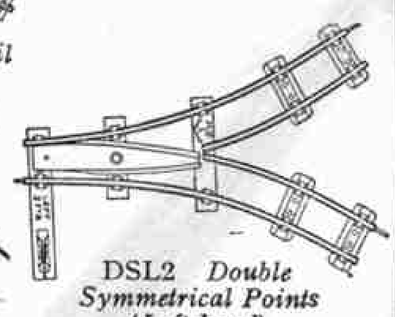
AB1 *Curved Brake Rail*



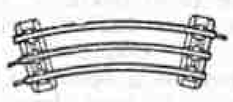
PR1 *Points (Right-hand)*



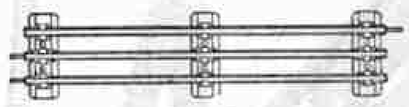
CR2 *Right-angle Crossing*



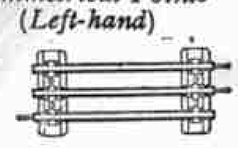
DSL2 *Double Symmetrical Points (Left-hand)*



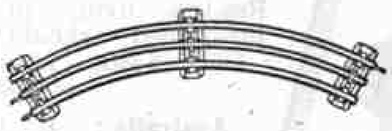
EA1½ *Electrical Curved Half Rail*



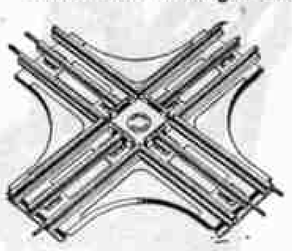
EB1 *Electrical Straight Rail*



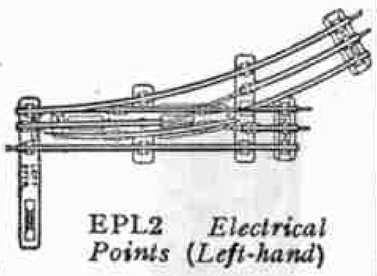
EB½ *Electrical Straight Half Rail*



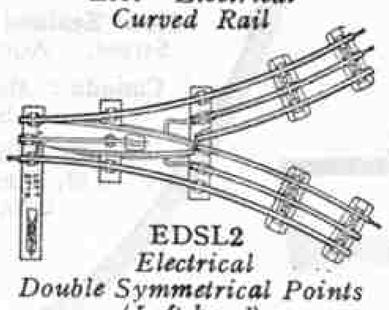
EA1 *Electrical Curved Rail*



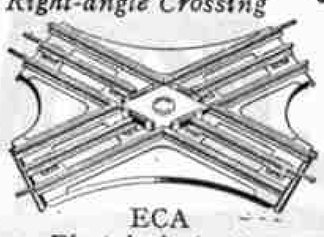
ECR *Electrical Right-angle Crossing*



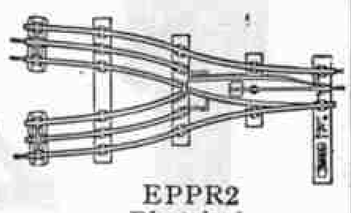
EPL2 *Electrical Points (Left-hand)*



EDSL2 *Electrical Double Symmetrical Points (Left-hand)*



ECA *Electrical Acute Angle Crossing*



EPPR2 *Electrical Parallel Points (Right-hand)*

PRICES OF RAILS, POINTS AND CROSSINGS ILLUSTRATED ABOVE

A1	Curved rails	... ...	doz	**4/6**	EA1½	Curved half rails ...	doz. **4/6**
A1½	Curved half rails	...	„	**3/6**	EB1	Straight rails ...	„ **6/–**
AB1	Curved brake rails	...	each	**6d.**	EB½	Straight half rails	„ **4/6**
B1	Straight rails	... ...	doz.	**4/–**	EPPR2	Parallel points, right hand	per pair **8/6**
B½	Straight half rails	...	„	**3/–**	EPPL2	Parallel points, left-hand	
BB1	Straight brake rails	...	each	**5d.**	EPR2	Right-hand points	per pair **7/6**
PR1	Right-hand points		per pair	**4/–**	EPL2	Left-hand points	
PL1	Left-hand points				EDSR2	Double symmetrical points, right-hand	per pair **8/6**
DSR2	Double symmetrical points, right-hand		per pair	**5/–**	EDSL2	Double symmetrical points, left-hand	
DSL2	Double symmetrical points, left-hand				ECA	Acute-angle crossings	each **4/–**
CR2	Right-angle crossings		each	**1/9**	ECR	Right-angle crossings	„ **4/–**
EA1	Curved rails	... ...	doz.	**6/6**			

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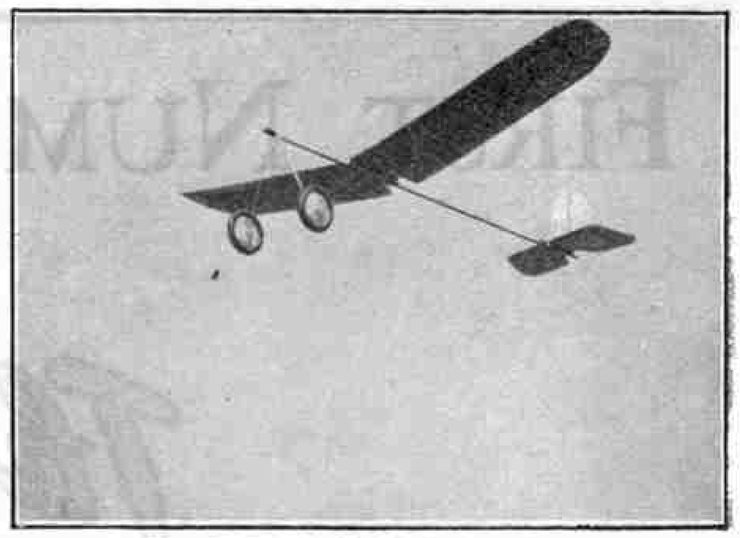
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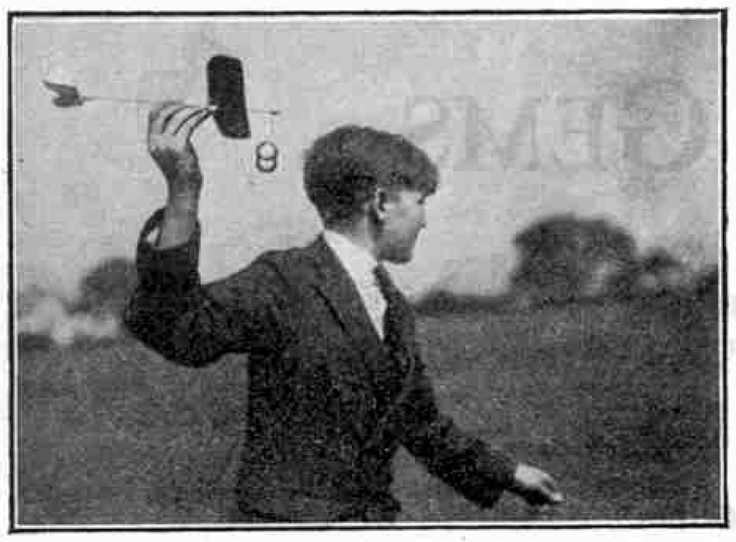
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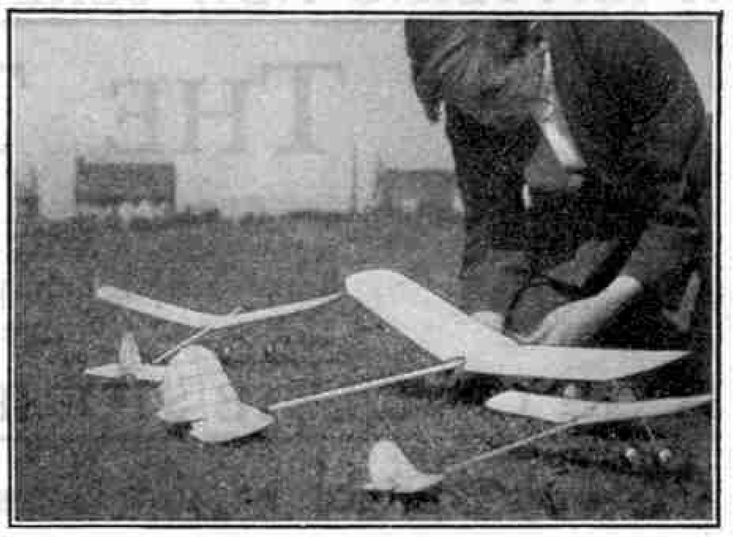
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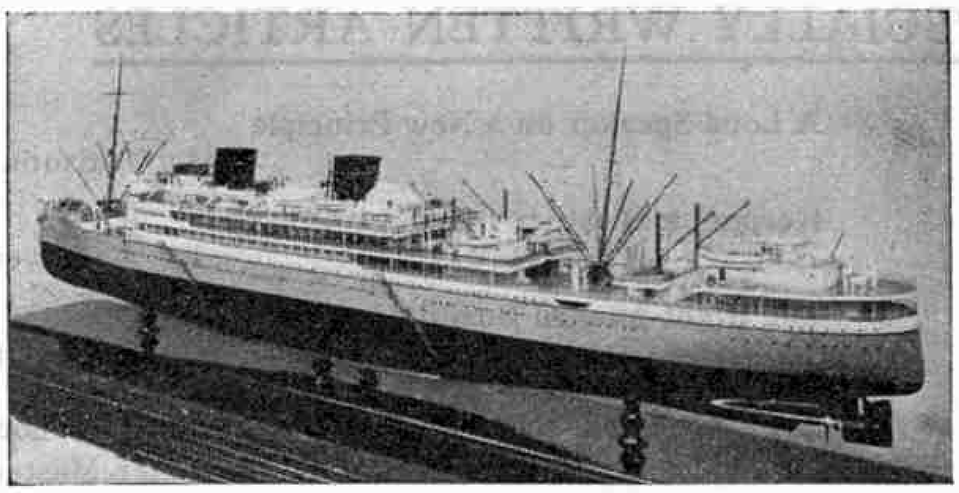
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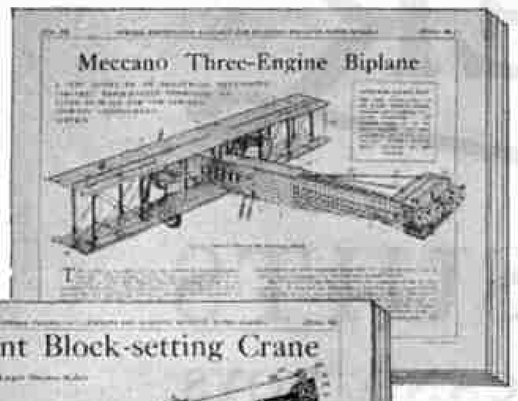
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A brief description of each model in the series is given below. Copies of the leaflets may be obtained from any Meccano dealer or direct from us, post free, at the prices shown at the foot of the page.



Leaflet No. 34



Leaflet No. 4



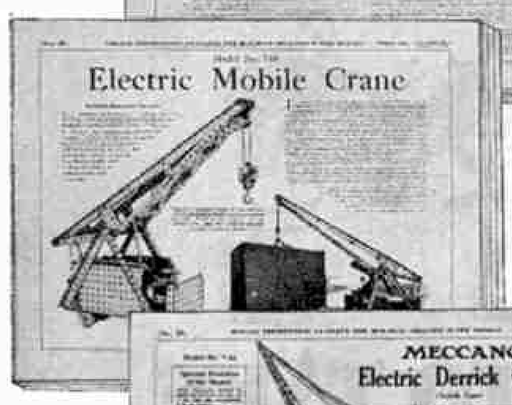
Leaflet No. 1



Leaflet No. 27



Leaflet No. 15



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No. 5 TRAVELLING BUCKET DREDGER. In this model trucks and wagons can run underneath the chute through which falls the material raised by the dredger buckets.

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No. 11 SINGLE-CYLINDER HORIZONTAL STEAM ENGINE. Fitted with balanced crankshaft crosshead, and centrifugal governor.

No. 12 STONE SAWING MACHINE. The model is equipped with adjustable work table and overhead trolley with self-sustaining chain hoist.

No. 13 MECCANOGRAPH. This wonderful model will draw hundreds of beautiful designs.

No. 14 GRANDFATHER CLOCK. A practical example of Meccano model-building. The model keeps accurate time.

No. 15 BALTIC TANK LOCOMOTIVE. The driving wheels are operated by an Electric Motor. An accurate reproduction of Walschaerts' Valve Gear is fitted.

No. 16 LOOM. This is perhaps the greatest Meccano success. The model weaves beautiful material.

No. 17 PLANING MACHINE. Fitted with quick-return motion.

No. 18 REVOLVING CRANE. This model is fitted with screw-operated luffing gear.

No. 19 STEAM SHOVEL. This model embodies travelling, rotating, racking and digging movements, and jib hoisting and lowering gear.

No. 19a STEAM EXCAVATOR, OR MECHANICAL DIGGER. A Meccano Steam Engine is incorporated in this model and provides the power for operating the four movements.

No. 20 MOBILE CRANE. This model has hoisting, luffing, travelling and slewing movements. It is fitted with an automatic brake on the hoisting shaft, an internal expanding brake on the front axle, and a limit switch to prevent over-winding of the jib in either direction.

No. 21 TRANSPORTER BRIDGE. The carriage automatically travels to and fro for as long as the motor is driven, pausing for a few seconds at each end of its travel.

No. 22 TRACTION ENGINE. A remarkably realistic model that will pull a boy of average weight. Fitted with two speeds.

No. 23 VERTICAL LOG SAW. While the saws are in motion, the logs are fed slowly to them.

No. 24 TRAVELLING GANTRY CRANE. The movements of this model comprise the traversing of the entire gantry, hoisting and lowering, and the traversing of the crane trolley.

No. 25 HYDRAULIC CRANE. The hydraulic ram is represented realistically by a powerful screw mechanism.

No. 26 TWIN ELLIPTIC HARMONOGRAPH. Some beautiful designs may be produced with this model.

No. 27 DRAGLINE. This imposing model of a giant excavator is fitted with travelling, luffing, slewing, and dragging movements.

No. 28 PONTOON CRANE. The movements of this model include the operation of the two hoisting blocks, slewing of the entire crane and luffing.

No. 29 HAMMERHEAD CRANE. This is a very realistic and powerful model, comprising traversing, hoisting and slewing motions.

No. 30 BREAKDOWN CRANE. This model is equipped with travelling, slewing, luffing, and hoisting motions, and also is fitted with laminated springs, brakes, out-riggers etc.

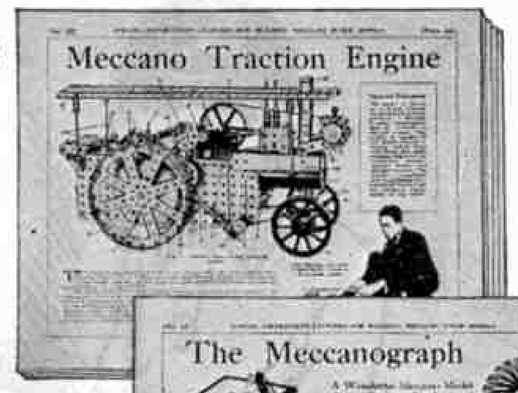
No. 31 WAREHOUSE WITH ELEVATORS. The two cages are driven automatically and work alternately, pausing at top and bottom positions.

No. 32 TWIN CYLINDER STEAM ENGINE AND BOILER. This is a realistic working model of a complete steam plant, equipped with valve gear, governor, balanced cranks, etc.

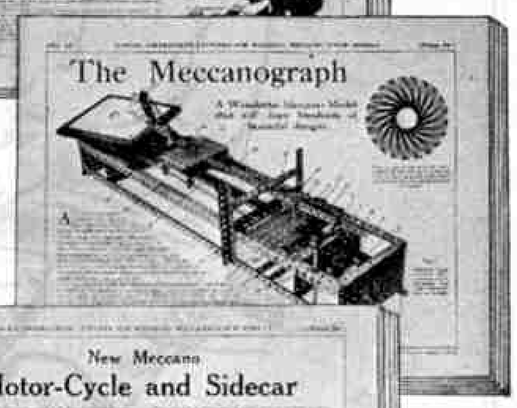
No. 33 SINGLE AND DOUBLE FLYBOATS. These two models represent popular pleasure-fair attractions.

No. 34 THREE-ENGINE BIPLANE. This is a realistic model of an "Argosy" machine, and is fitted with ailerons, elevators and rudders.

No. 36 ELECTRIC DERRICK CRANE (Scotch Type). This imposing model is built to a scale of ¾ in. to 1 ft., the jib measuring 6 ft. in length. The movements include hoisting and lowering, luffing and slewing



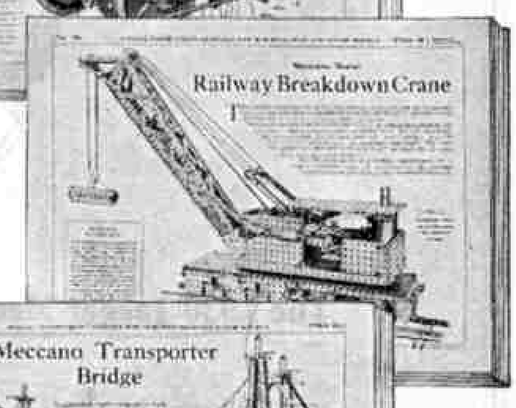
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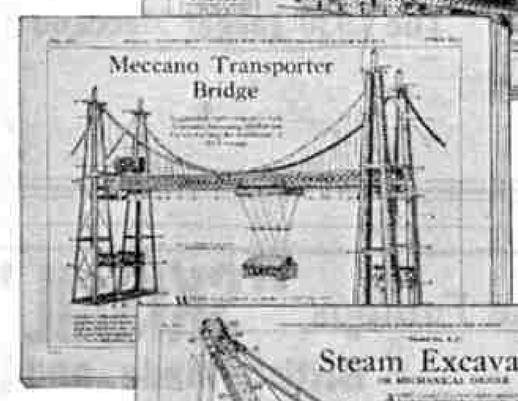
Leaflet No. 13



Leaflet No. 3



Leaflet No. 30



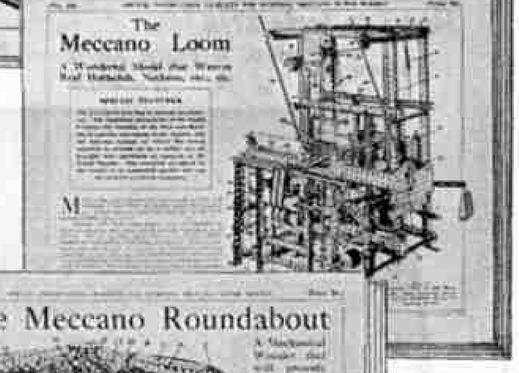
Leaflet No. 21



Leaflet No. 19a



Leaflet No. 33



Leaflet No. 16



Leaflet No. 8

Prices of Meccano Super Model Leaflets:—

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Colours—Navy, Steel Grey, Fawn, Brown, Brown Mixture, Fawn Mixture,
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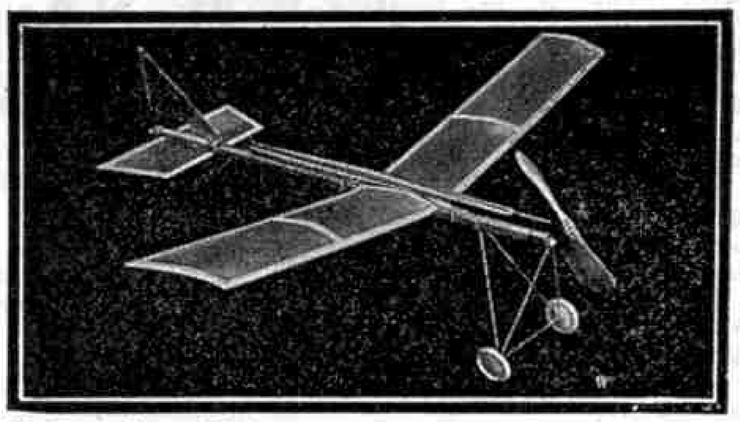
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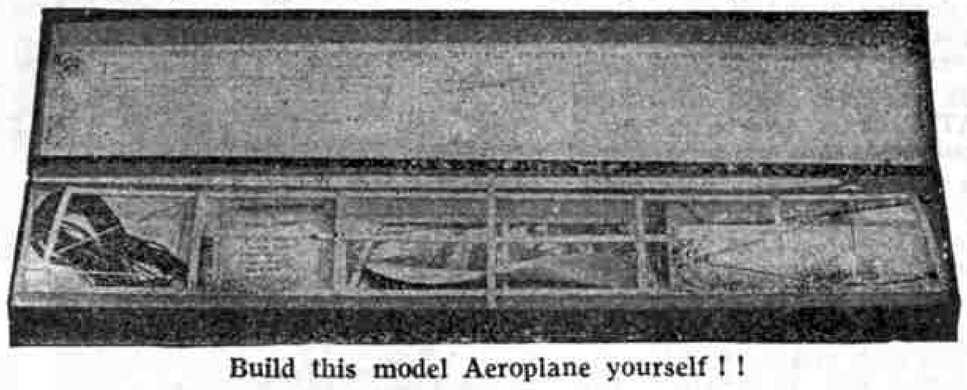
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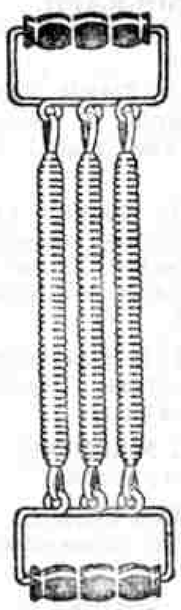
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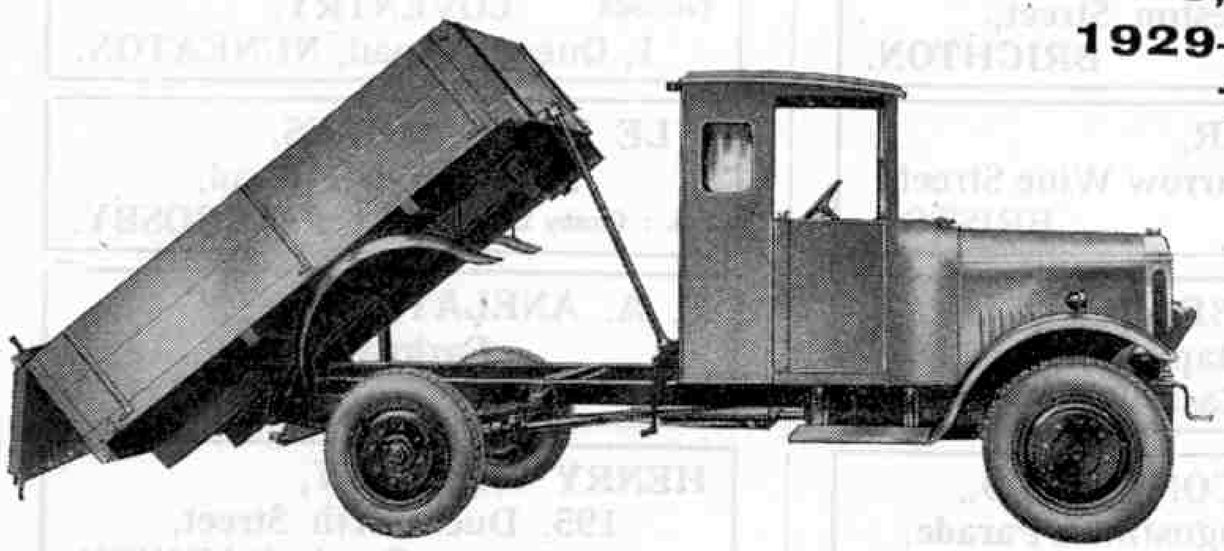
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1926—384,124
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1930 . . . . . ?



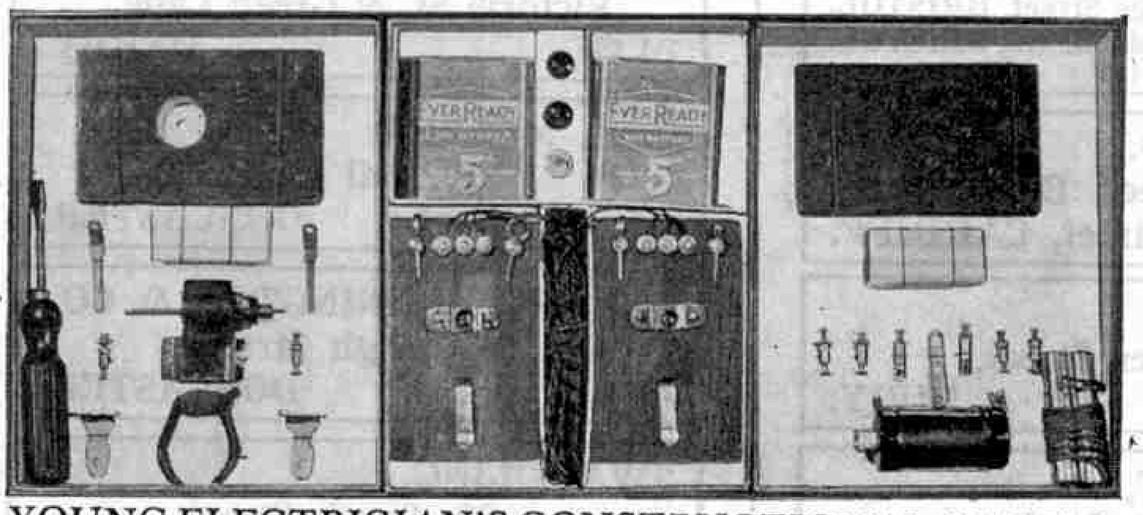
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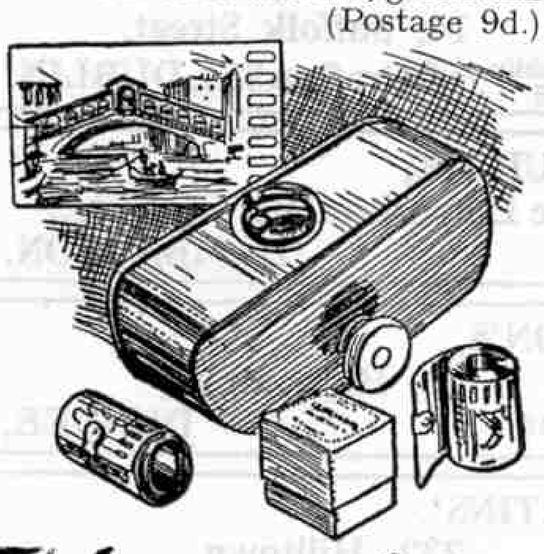
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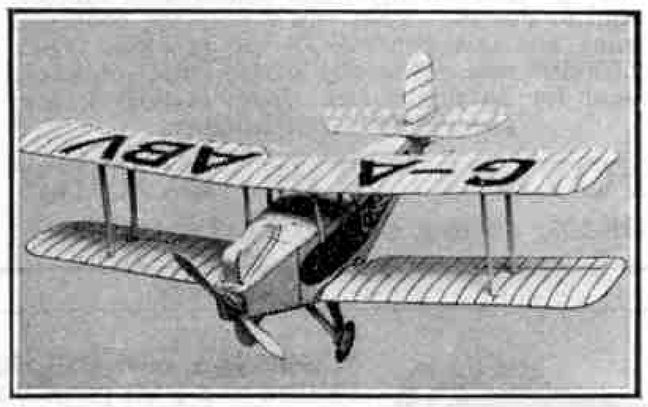
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Famous Aero Engines—

(*Continued from page 780*)

contained in a larger volume of air at a higher altitude. From this it follows that the position of the throttle that would cause the fuel to combine with only half the available oxygen near sea level, would give the equivalent of full-throttle operation at approximately 18,000 ft. From the pilot's standpoint this is a very desirable characteristic, since the engine tends always to give the most economical result, and there is no necessity for continual adjustments in the fuel supply to be made for varying altitudes.

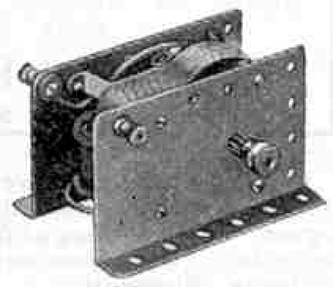
The advantages of the crude oil engine for aircraft have attracted the attention of engineers all over the world, and engines of this type have been produced by English, German, French and Swedish firms. The British Beardmore "Tornado," the first practical aero engine to use heavy oil, is fitted in the airship "*R101*." Another British Diesel type engine is the Sunbeam "Coatalen," which, like the "Tornado," is more suited for service in airships than in aeroplanes. The details of the "Tornado" are not yet available, but we intend to publish a description of this remarkable engine, together with a number of illustrations, as soon as possible.

The German engine, produced by the well-known Junkers firm, is of the two-stroke double-piston type, and has a weight-power ratio of only 2.6 lb. per h.p. The total power developed is 650 h.p. as compared with the 720 b.h.p. of the "Tornado." The Junkers engine has six cylinders arranged vertically in a single block. The French engine resembles the Packard engine more closely than any of the others. It is of the nine-cylinder air-cooled radial type, weighing about 4½ lb. per h.p., and has made several successful flights. There is little definite information available about the Swedish Diesel, but a very high efficiency is claimed for it.

New 6-Volt Motor

A new Meccano 6-volt Electric Motor, known as No. E1, has now been introduced.

As will be seen from the illustration, the new Motor has been designed on similar lines to the existing No. 1 6-volt Motor, but it is fitted with smaller side plates and a reversing switch is not included. The armature shaft of the Motor is fitted with both a pinion and grooved pulley, and the side plates are flanged and perforated with standard Meccano equidistant holes, so that the Motor can be fitted easily to any model that it is required to drive.



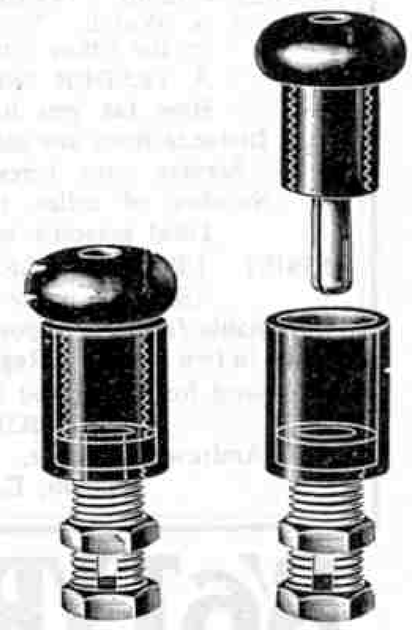
The No. E1 Motor may be operated from a 6-volt Accumulator, or from the house lighting mains through the transformer supplied by Meccano Ltd. It cannot be run satisfactorily from dry cells. Details of models incorporating this new Motor will appear in the "*M.M.*" shortly. The price of the new Motor is **7/6**.

A Welding Contest

Commencing with the November issue the Proprietors of "The Welder" have decided to offer a monthly prize of £5-5s. for the best illustrated article describing interesting jobs undertaken by the Electric Arc Welding Process. For further particulars apply to the Alloy Welding Processes Ltd., Ferry Lane Works, Forest Road, Walthamstow, London, E.17.

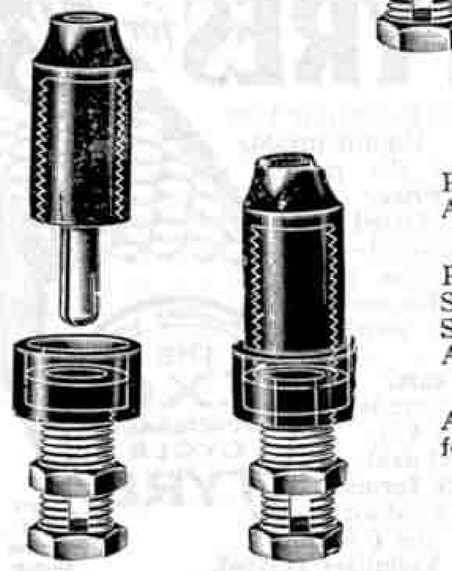
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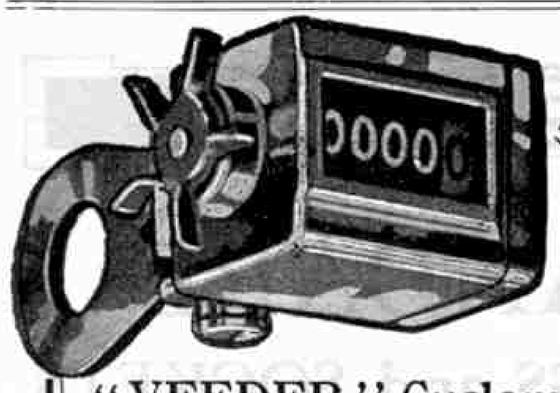


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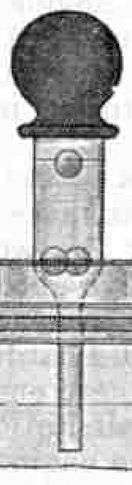
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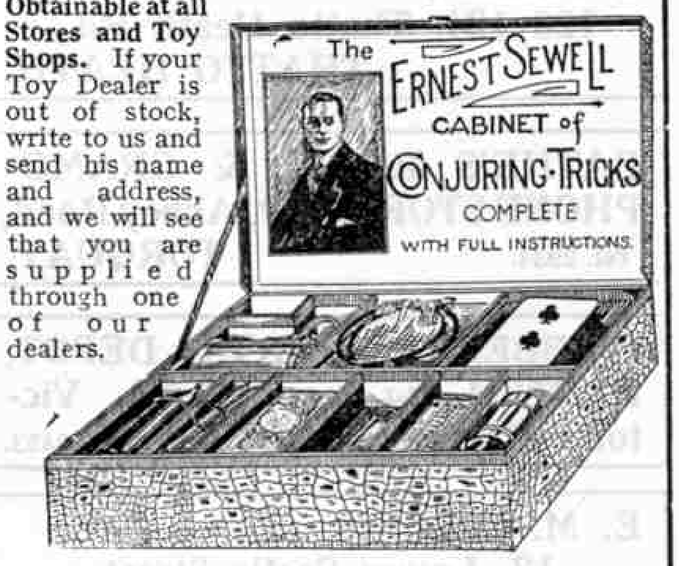
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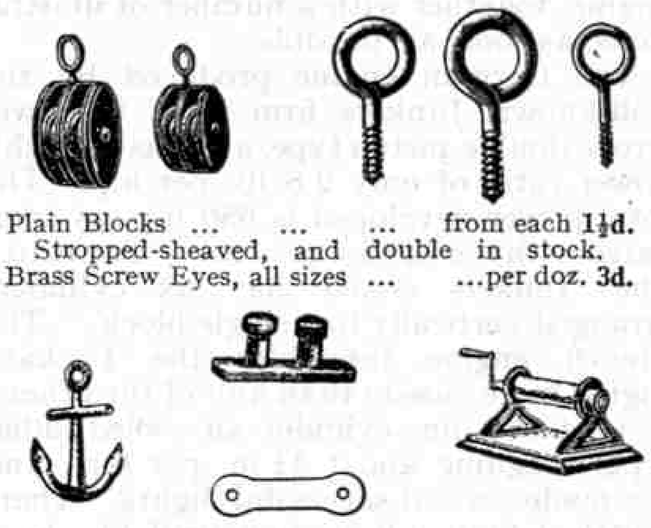
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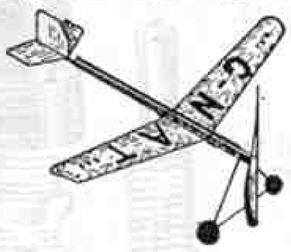
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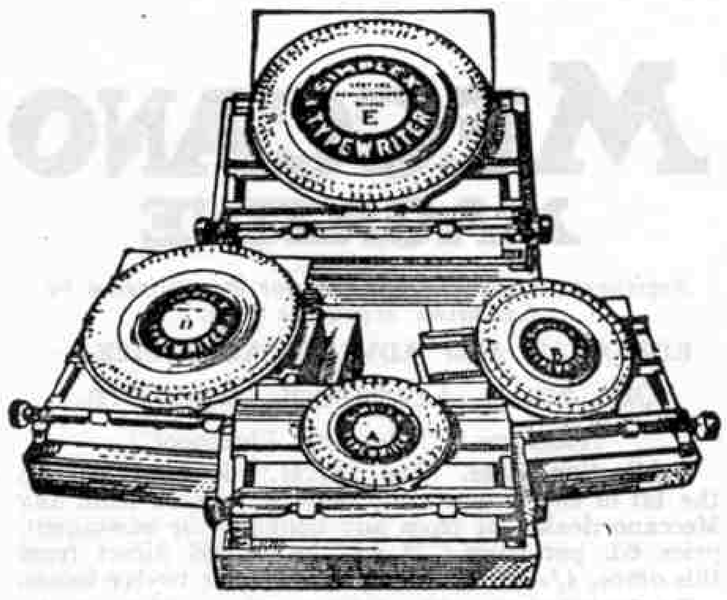
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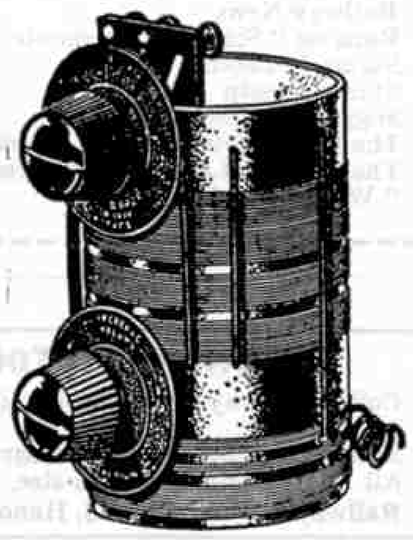
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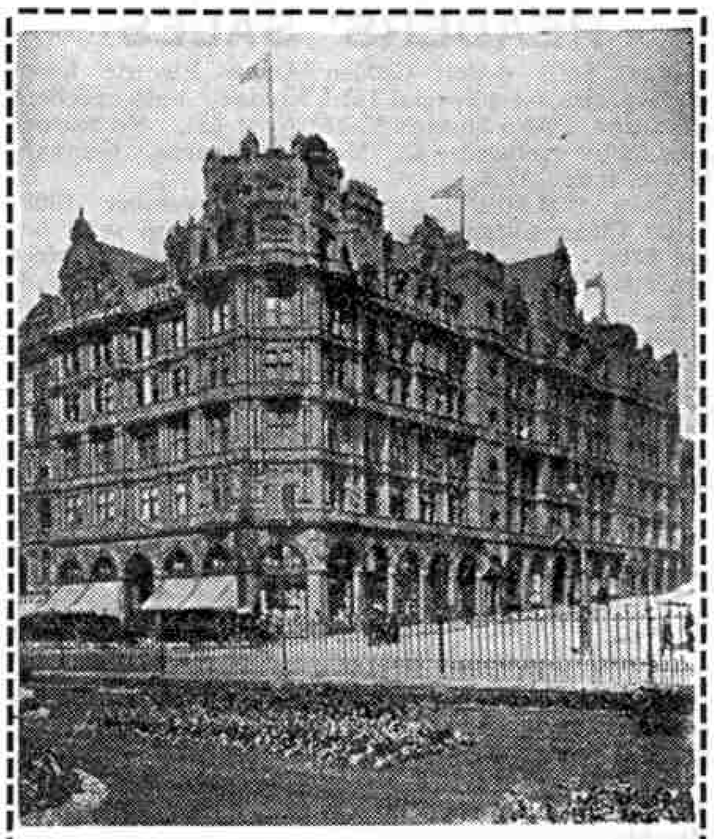
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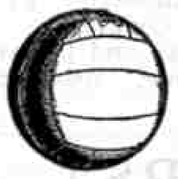


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H.R.C. Junior Section—(*Continued from page 805*)

included in it. Great opportunities for imitating the work of signalmen in real practice would thus be afforded, and would provide a great amount of interest in working the traffic of the line. In order to stop the trains either at a station or where a signal happened to be at "danger," it would be advisable to provide brake and reverse rails, as the possibility of checks could not be taken into account in winding the locomotive. These would, of course, be operated by the signalmen concerned.

A signalling installation of the kind we have indicated—especially if operated from lever frames in the correct manner, the main line points also being thus worked—will be found to provide far more interest than can be obtained from a layout in which the signals are more or less ornamental and are scarcely ever used. It is not possible, of course, to employ such complicated equipment as is used in real practice, but as long as the signals are placed in accordance with correct principles the system may be considered sufficient.

Protection should be afforded to points in order to reduce the risk of collisions, although in places where shunting movements are carried out under the eye of the signalman, signals may be omitted if space for them is limited and several are required. Thus in the layout shown, the locomotive yard is not provided with signals to give the right of way in and out. A ground-disc or "Tommy Dodd" might be provided at the points by the platform end, but this would really be a luxury. Similarly no signal is provided near the cabin at the point where the siding road joins the platform line. This signal is omitted for the sake of simplicity, because permission for a locomotive or train to leave the yard and to proceed along the platform road could be given by a hand signal from the man in the cabin.

MECCANO MAGAZINE

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OLD SWAN, LIVERPOOL, ENGLAND.

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To Contributors. The Editor will consider articles and photographs of general interest and payment will be made for those published. Whilst every care will be taken of articles, etc., submitted, the Editor cannot accept responsibility for any loss or damage. A stamped addressed envelope of the requisite size should be sent where the contribution is to be returned if unacceptable.

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Advertisers are asked to note that private advertisements of goods manufactured by Meccano Limited cannot be accepted.

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Display. Quotations for space bookings, and latest net sale figures, will be sent on request.

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Proofs of advertisements will be sent when possible for space bookings of not less than half-an-inch.

Voucher copies. Sent free to advertisers booking one inch or over. Other advertisers desiring vouchers should add 8d. to their remittance and should order voucher copy at same time.

Remittances. Postal Orders and Cheques should be made payable to Meccano Ltd.

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Readers Overseas and in foreign countries may order the "*Meccano Magazine*" from regular Meccano dealers or direct from this office. The price and subscription rates are as above, except in the cases of Australia, where the price is 1/5 per copy (postage extra), and the subscription rates 9/6 for six months and 19/– for 12 months (post free); Canada, where the price is 15c. per copy, and the subscription rates 75c. for six months, and $1.50 for 12 months (post free).

The U.S.A. price is 15c. per copy, and the subscription rates $1 and $2 for 6 and 12 months respectively (post free).

Overseas readers are reminded that the prices shown throughout the "*M.M.*" are those relating to the home market. Current Overseas Price Lists of Meccano Products will be mailed free on request to any of the undermentioned agencies. Prices of other goods advertised may be obtained direct from the firms concerned.

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UNITED STATES: Meccano Co. of America Inc., New Haven, Conn. Meccano Co. of America Inc., 200, Fifth Av., New York.
AUSTRALIA: Messrs. E. G. Page & Co., 52, Clarence Street, Sydney, N.S.W.
NEW ZEALAND: Models Ltd., Kingston & Federal Streets, Auckland.
SOUTH AFRICA: Mr. A. E. Harris (P.O. Box 1199), 142, Market Street, Johannesburg.
INDIA: Karachi: Bombay Sports Depot, Elphinstone Street, Bombay; Bombay Sports Depot, Dhobi Talao. Calcutta: Bombay Sports Depot, 13/C, Old Court House Street.

The Editor wishes to make known the fact that it is not necessary for any reader to pay more than the published price. Anyone who is being overcharged should lodge a complaint with the Meccano agent in his country or write direct to the Editor.

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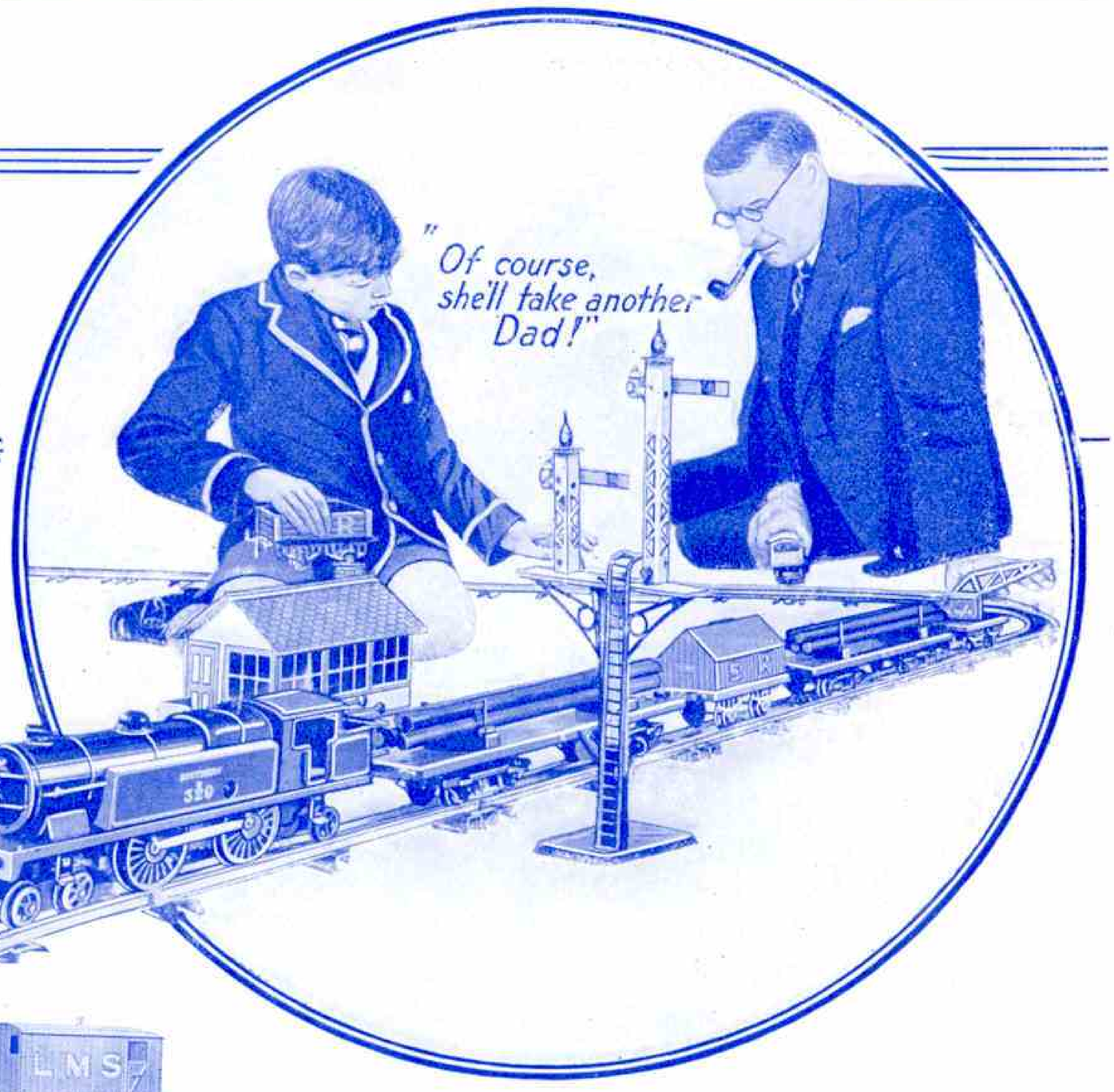
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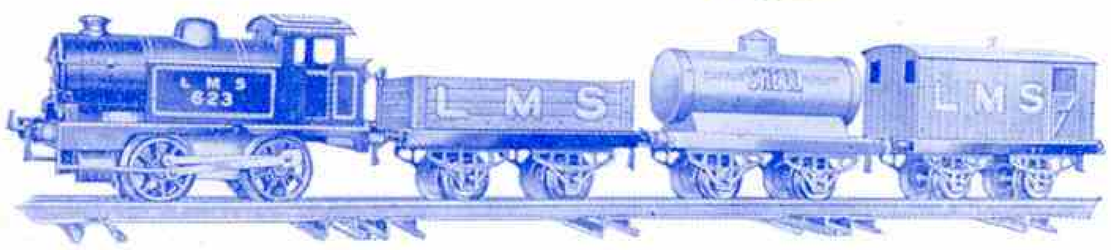
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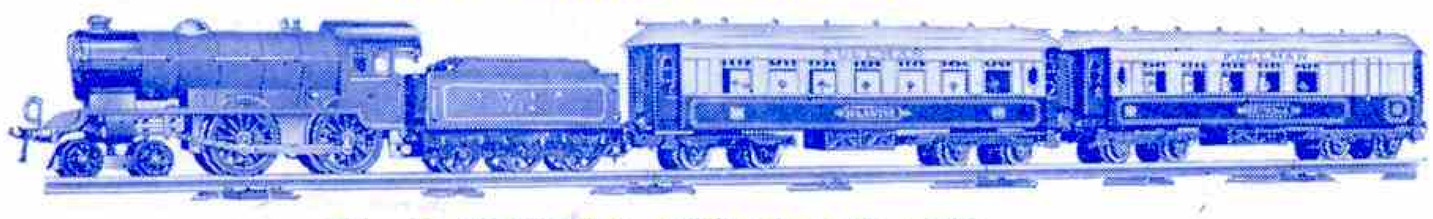
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